K.9 3/27/01

Proposed Plan
Source Control Response Action

Office of Community Relations
1021 North Grand Ave. East P.O. Box 19276 Springfield, Illinois 62794-9276

Southeast Rockford Groundwater Contamination Superfund Site

Rockford, Winnebago County, Illinois March 2001

Public Comment Period
Illinois EPA will accept written comments on the Proposed Plan during a public comment period of **March 12, 2001 to April 11, 2001.**

Public Hearing
Illinois EPA will hold a public hearing to explain the Proposed Plan and the alternatives presented. Oral and written comments will also be accepted at the hearing.
Date: March 27, 2001
Time: 7:00 PM
Place: Ken Rock Community Center
3218 South Eleventh Street
Rockford, Illinois

INTRODUCTION

Illinois EPA Announces Proposed Plan

The Illinois Environmental Protection Agency ("Illinois EPA") in consultation with the United States Environmental Protection Agency Region V ("USEPA") is proposing a *remedial action* that will address contaminated soil and *leachate* at four *source areas* within the *Southeast Rockford Groundwater Contamination Superfund Site* in Rockford, Illinois. The four source areas, identified as Area 4, Area 7, Area 9/10 and Area 11 are shown within Figure 1 on page 3.

This *Proposed Plan* identifies the cleanup alternatives and preferred option for the final remedy at the *site* and outlines the public's role in the selection of a remedy. The Illinois EPA, the lead agency for site activities, and the USEPA, the support agency for this remedial action, issue this document. Illinois EPA, in consultation with USEPA, will select a final remedy for the site only after the public comment period has ended and the information submitted during this time has been reviewed and considered.

Illinois EPA is issuing this Proposed Plan as part of its public participation responsibilities under section 117(a) of the *Comprehensive Environmental Response, Compensation and Liability Act ("CERCLA or Superfund")*, as amended by the *Superfund Amendments and Reauthorization Act ("SARA")* of 1986. This document summarizes information that can be found in greater detail in the July 25, 2000 *Remedial Investigation ("RI")* report and the September 5, 2000 *Feasibility Study ("FS")* report, as well as other documents contained in the *administrative record* file for this site. Illinois EPA and USEPA encourage the public to review these other documents in order to gain a comprehensive understanding of the site and Superfund activities that have been conducted there. The administrative record file which contains the information upon which the selection of the response action will be based, is available at the Rockford Public Library-Main Branch at 215 North Wyman in Rockford. The RI and FS reports are both available at either of the site Information Repositories located at the following locations:

Rockford Public Library-Rock River Branch
3134 South Eleventh Street
Rockford, Illinois
Ken Rock Community Center

3218 South Eleventh Street
Rockford, Illinois

Illinois EPA, in consultation with the USEPA, may modify the preferred alternatives or select another response action presented in this Plan and the FS report based on new information or public comments. Therefore, the public is encouraged to review and comment on **all** the alternatives identified here in the Proposed Plan. A glossary of terms is provided on page 84 of this proposed plan. Terms included within the glossary are printed in *italics* when being used for the first time.

A fact sheet and public notice discussing this Proposed Plan are available at both Information Repositories.

SITE BACKGROUND

SITE DISCOVERY AND REMOVAL ACTIONS

The Southeast Rockford Groundwater Contamination Site, as originally proposed for the *National Priorities List* in June of 1988, was an area encompassing about 0.7 square miles in Rockford, Illinois. The 0.7 square mile area included residential and commercial properties. Presently, land use within the original site boundaries continues to be residential and commercial. The original boundaries of the site included an area of private wells bounded by Harrison Avenue to the north, Sawyer Road to the south, Twenty-First Street to the east and Eighth Street to the west. The current boundaries of the site are defined by the extent of *groundwater* contamination with concentrations of total *volatile organic compounds* ("VOCs") above 10 *parts per billion* ("ppb") (Illinois EPA, *OU2 ROD* 1,3). The site currently covers about 3 square miles. Figure 1 on page 3 identifies the site and its approximate boundaries.

Groundwater contamination is of major concern in Winnebago County as the county and the city of Rockford derive 100% of its water supply from groundwater through private, industrial, and municipal supply wells (Cobb).

FIGURE 1 —

Although VOCs were initially detected in several municipal wells owned by the City of Rockford in 1981, the Illinois EPA became aware of a VOC problem in residential wells in 1984 after investigating reports that plating wastes had been illegally disposed of in a private well. In October 1984, the Illinois Department of Public Health ("IDPH") initiated a study that involved the sampling of 49 private wells in the vicinity of this well. Significant levels of contaminants associated with plating wastes were not found in the study, but high levels of chlorinated *solvents* (similar to the VOCs found in the municipal wells earlier) were found in many of these private wells. The solvents found in the private wells included trichloroethene ("TCE"), tetrachloroethene ("PCE"), and 1,1,1-trichloroethane ("1,1,1-TCA"). (Illinois EPA, *OU2 ROD*)

Illinois Department of Public Health took an additional 337 water samples from residential wells between 1985 and 1989 to determine how many residents' wells were affected by groundwater contamination. The Illinois State Water Survey also performed a regional groundwater investigation between 1986 and 1988. This investigation also verified widespread residential and municipal well contamination. Several municipal wells owned by the City of Rockford were closed as a result of groundwater contamination in southeast Rockford. (Illinois EPA, *OU2 ROD*)

As a result of the widespread groundwater contamination within southeast Rockford, the site was proposed for inclusion on the National Priorities List (NPL or "Superfund List") on June 24, 1988 and was formally added to the NPL on March 31, 1989 as a state-lead, federally funded Superfund Site (United States 1988, 1989). In August 1989, USEPA sampled 112 residences around the site to determine if an immediate *removal action* was warranted. Later in 1989, USEPA initiated a time critical removal action in which residents whose water well analyses revealed VOC levels greater than or equal to 25% of the *Removal Action Level* were provided with bottled water as a temporary measure. The same residents received point-of-use carbon filters in December 1989 as another intermediate measure. The USEPA ultimately extended water mains and provided service connections to city water for 283 residences as a time critical removal action. This action was completed in late 1991. (Illinois EPA, *OU2 ROD*)

OPERABLE UNIT ACTIVITIES

Operable Unit One

Because of the size and complexity of the groundwater contamination in the area, the Illinois EPA and USEPA planned and organized activities at the site as smaller, more manageable groupings of activities called *operable units*. The Illinois EPA and its consulting/engineering firm, Camp Dresser & McKee ("CDM"), began work under the first operable unit ("OU1") with a remedial investigation. The primary focus of OU1 was to address contamination in residential wells. An additional 117 private wells were sampled as a part of the Operable Unit One Remedial Investigation. The objective of this sampling event was to determine how many homes had wells with levels of VOCs

below the time critical removal action cutoff (discussed previously), but above *Maximum Contaminant Levels* ("MCLs"). Illinois EPA's sampling revealed that additional residences needed to be connected to the city's water supply system. A proposed plan for Operable Unit One was made public in March 1991. A *Record of Decision* ("ROD") for Operable Unit One was signed on June 14, 1991. The ROD called for more residences to be hooked up to the municipal water supply system and for a temporary *granular activated carbon* ("GAC") water treatment unit to be installed at one of Rockford's municipal wells. The municipal well been closed in 1985 due to unsafe levels of VOCs (CDM, 1990). The GAC unit was installed to assure sufficient potable water capacity for residents added to the city's water distribution system. By November 1991, an additional 264 homes were connected to city water. Between the USEPA's time critical removal action (described earlier) and Illinois EPA's Operable Unit One, a total of 547 homes received service connections to the city's water supply system. All 547 homes received hookups to city water by November 1991 and a Remedial Action Report was signed by USEPA on December 21, 1992. The Remedial Action Report certified that the selected remedy for Operable Unit One was operational and functional (Illinois EPA, *OU2 ROD*)

Operable Unit Two

Remedial Investigations for the second Operable Unit ("OU2") began in May, 1991 under the direction of the Illinois EPA (CDM, 1992). The objective of the OU2 RI was to characterize the nature and extent of groundwater contamination throughout the site, as well as to provide information on "source areas" that were responsible for the contamination (CDM, 1992). The RI was conducted in two phases because of the size and complexity of the site. Phase I activities expanded the original NPL boundaries into a larger study area within Southeast Rockford containing approximately 5 square miles (CDM, 1993 1-2). Operable Unit Two, Phase I field activities included the following: 1) 225-point *soil gas* survey; 2) 33 monitoring wells were installed at 11 locations and sampled; 3) 19 Illinois State Water Survey Wells and 16 industrial wells were sampled (CDM, 1993 1-2). Fieldwork for Phase I was completed in October of 1991 and based on preliminary data, identified eight potential sources of groundwater contamination (CDM, 1992).

Operable Unit Two, Phase II field activities were conducted from January 1993 to January 1994. The following activities were conducted during the Phase II investigation: 1) 212 soil gas points were sampled; 2) 44 monitoring wells were installed and 165 groundwater samples were obtained; 3) 55 soil borings were conducted and 126 soil samples were obtained; 4) 24 groundwater samples were obtained from residential wells; 5) 20 residential air samples were taken; and 6) two test pits were excavated in the study area. (CDM, 1995 RI 1-1)

Although several other groundwater plumes of contamination were identified, the Phase II investigation concluded that there were four primary source areas that were impacting the major plume that constitutes the site. The four primary source areas, Area 4, Area

7, Area 9/10, and Area 11 are identified on Figure 1, page 3.

Phase II activities also included groundwater modeling. Using reasonable assumptions, this modeling was useful in predicting future contaminant concentrations within the plume and projecting general plume migration directions. The modeling indicated that contaminant levels for 1,1,1-TCA in the plume will remain at levels above its MCL of 200ppb for 205 years assuming that the four source areas are remediated. (CDM, 1995 FS 5-3)

Based on the results of the Remedial Investigation and Feasibility Study ("RI/FS") conducted under OU2, Illinois EPA issued a Proposed Plan on Operable Unit Two in July of 1995. The ROD for OU2 was signed on September 29, 1995. The major components of the selected remedy included: municipal water hook-ups for homes and businesses projected to have combined concentrations of 1,1,1-TCA and 1,1-Dichloroethane ("1,1-DCA") at levels of 5 ppb or greater; groundwater monitoring for 205 years; and future source control measures at the four primary source areas, Area 4, Area 7, Area 9/10, and Area 11. Although source control was a component of the selected remedy within the Operable Unit Two ROD, the ROD stated that the actual technology to be used for source control measures would be addressed within Operable Unit Three.

Operable Unit Three

Fieldwork for Operable Unit Three RI began under the direction of Illinois EPA on May 20, 1996. The investigation included: soil gas samples and soil borings at all four areas; surface water and sediment sampling at Area 7; and monitoring well installation and groundwater sampling at Area 9/10. In total, the Operable Unit Three ("OU3") investigation included: 1) 68 soil gas samples; 2) 13 soil borings with one soil sample per boring in Areas 4, 7, and 11 and 2 samples per boring in Area 9/10; 3) Dye shaker testing for the presence of *non-aqueous phase liquid* ("NAPL"); 4) 14 surface soil samples; 5) Geoprobe groundwater screening at 3 locations; 6) Installation of 3 monitoring wells; and 7) 5 groundwater samples. (CDM, 2000 RI)

The results of the OU3 investigations along with information obtained from previous investigations were used to characterize the four source areas as described within the section of this Proposed Plan entitled "Description of Source Areas".

Enforcement Activities

Since the development of the 1995 ROD, there have been two major enforcement agreements developed between the U.S.EPA /Illinois EPA ("the Agencies") and persons associated with the Southeast Rockford site. The first of these was a consent decree entered by the federal district court in Rockford in April 1998. This decree requires the City of Rockford to install water mains and services within the public right-of-way, provide needed connections to homes and businesses, supplement the previously existing groundwater well monitoring network with new wells, and commence a long-term well network sampling and analytical program. This work has entered the

monitoring phase. Over 9200 feet of new water mains have been installed, and an additional 262 individual water service connections have been made. Nine new groundwater monitoring wells were installed, with several of these located near the Rock River. The consent decree also required the payment of up to $200,000 by the City of Rockford to the State of Illinois and federal government, for future oversight costs.

The court entered the second consent decree in January 1999. This decree provided for the reimbursement of approximately $9.1 million dollars for costs expended over the years by the Agencies in responding to the Southeast Rockford site, as well as a portion of future clean up costs for Area 7 of the site of approximately $5 million dollars plus interest. An innovative feature of this decree was that it also anticipates the need to perform remediation at Area 7. Unlike the other soil source areas of concern, Area 7 is unique in that it appears waste materials were brought there from other locations.

SITE CHARACTERISTICS

The Southeast Rockford Groundwater Contamination Site encompasses approximately 3 square miles. The site is defined primarily by the extent of groundwater contamination in the area. Property uses within the site boundaries include: residential, light industrial, industrial, and municipal. Remedial actions conducted under Operable Units One and Two addressed the area-wide groundwater contamination but required additional work at the four source areas. With the exception of the four source areas, remedial actions conducted under OU1 and OU2 addressed unacceptable risks to human health[1] and the environment throughout the 3 square miles contained within site boundaries. The site characteristics for the four source areas are the subject of this Proposed Plan and are described below.

DESCRIPTION OF SOURCE AREAS

Source Area Four

General Description

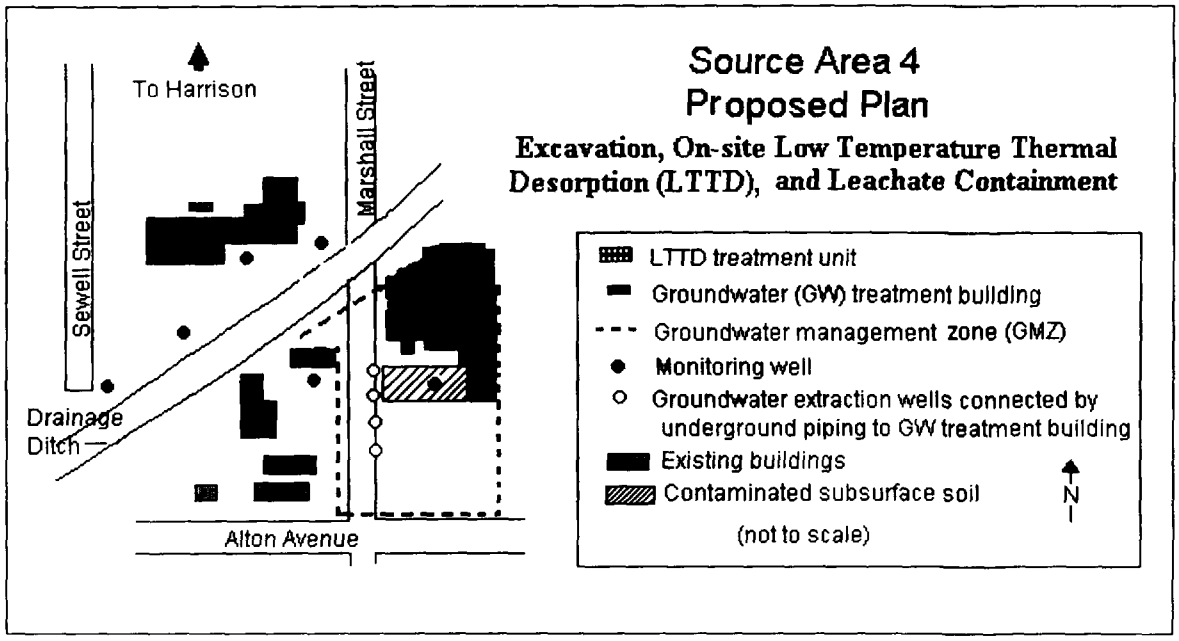
Source Area Four (Area 4) is bounded by Harrison Avenue to the north, Alton Avenue to the south, and Marshall Street to the west. Barrett's Mobile Home Park is located just east of the area. Figure 2 on the following page identifies Area 4. The source of contamination is believed to be leaking *underground storage tanks* beneath the parking lot of Swebco Manufacturing, Inc located at 2630 Marshall Street. (CDM, 1993 2-14). Swebco was a precision machining shop that produced metal parts. The property is approximately one acre in size and is currently zoned light industrial. Properties surrounding Area 4 include small businesses as well as single-family homes. The

[1] For more information on "human health risks" see definition within Glossary

properties surrounding Area 4 are currently zoned either residential or light industrial. Officials with the City of Rockford Planning Division indicate that future plans for Area 4 and surrounding properties are consistent with current uses (Dust).

Illinois EPA Bureau of Land files indicate that three underground storage tanks were used by Swebco at Area 4. The underground storage tanks are located beneath the parking lot at the facility and available information indicates and that they are likely to be empty (CDM, 2000 RI 1-5). The past contents of the tanks have been reported to be fuel oil and waste oil (CDM, 2000 RI 1-5). It is suspected that the waste oil may have contained 1,1,1-TCA, which is a non-carcinogen.

Figure 2



Soil borings performed within Area 4 to depths of approximately 30 feet below ground surface ("bgs") indicate the subsurface is largely comprised of medium grain sand (CDM, 1995 Appendix A). Borings indicate that the sand is overlain with approximately 5 feet of silty topsoil in most areas. Groundwater is encountered at approximately 29 feet bgs in the vicinity of the source (CDM, 2000 RI 3-1). Groundwater in the unconsolidated sediments beneath Area 4 flows in west-northwest direction (CDM, 1995 RI 4-41).

In December of 1993, during Phase II of the OU2 RI, high concentrations of 1,1,1-TCA were found in soils beneath a parking lot at the Swebco facility (CDM, 1995 RI 4-37,4-41). Further investigation identified soil contamination at concentrations up to 510 *parts per million* ("ppm") and appears to extend to a depth of 35 feet (CDM, 2000 RI 3-1). The extent of contaminated soils is an area approximately 50 by 75 feet with the long axis oriented east-west (CDM, 2000 RI 3-1). Assuming a thickness of 8 feet and an

average 1,1,1-TCA soil concentration of 275ppm, the volume of highly contaminated soil was estimated at 1,100 yd^3 with a weight of 1,1,1-TCA at 977 pounds (CDM, 2000 RI 4-41). As 1,1,1-TCA from the contaminated soils are water soluble, contaminants from Area 4 are highly mobile in groundwater as evidenced by high levels of 1,1,1-TCA (1 ppm) in *down gradient* wells (CDM, 1995 RI 4-99). The cause of contamination is believed to be a single source which consists mostly of 1,1,1 TCA (CDM, 2000 RI 3-1). Table 1 on page 11 shows the maximum concentrations of the contaminants of concern at Area 4.

Soil Gas and Indoor Air

Soil gas (i.e. air in the void spaces within soil) concentrations of 1,1,1-TCA at Area 4 range from below detection limits to 7.2 ppm (CDM, 2000 RI 3-3). Residential air sampling identified 1,1,1-TCA, TCE, PCE, 1,1-DCA, and 1,1-Dichloroethylene (1,1-DCE) in indoor air of homes within the area (CDM, 1995 RI 4-83). The 1995 RI Report concluded that the results could not be directly correlated with groundwater contamination. The report also concluded that concentrations for all compounds were below health based air guidelines available in 1995 (CDM, 1995 RI 4-85, 90). Because the majority of the indoor air samples with significant detections were those taken from sump pits in basements of homes in Area 4, IDPH recommended that the pits be filled to limit potential exposure. Contact with the owners of homes with sump pits indicated that many had taken the advice of IDPH and filled the pits.

U.S. EPA has recently started considering new indoor air screening values that have been established by U.S. EPA Region 9. Upon re-evaluation of existing indoor air data from homes near Area 4, U.S. EPA and Illinois EPA have decided to conduct new indoor air analysis in homes near Area 4 to ensure that concentrations are below levels of concern. Illinois EPA plans to conduct the indoor air analysis during the design of potential remediation. Illinois EPA and U.S. EPA will begin planning the indoor air sampling program as soon as possible. Because of the complicated nature of indoor air sampling, actual fieldwork may not begin until sometime in 2001.

Surface Soils

Surface soil samples from Area 4 identified several VOCs including 1,1,1-TCA at concentrations up to 0.1 ppm (CDM, 1995 RI 4-34). *Polynuclear Aromatic Hydrocarbons* ("PNAs"), and compounds associated with pesticides and *polychlorinated biphenyl* ("PCBs") were also identified in Area 4 soils. Concentrations of PCBs and pesticides found in Area 4 surface soils do not pose a threat to human health. Concentrations of individual PNAs ranged from below detection (non-detection "ND") to 16 ppm (CDM, 2000 RI Table 3-1). Concentrations of PCB and pesticides ranged from ND - .100 ppm (CDM, 1995 RI 4-34) and ND - .026 ppm (CDM, 2000 RI Table 3-1).

Sub-Surface Soils

Sub-surface soil samples from approximately 3 to 10 feet bgs at Area 4 showed higher concentrations of VOCs, PNAs, and pesticides. Elevated concentrations for VOCs and PNAs were found primarily in two soil borings (SB4-1 and SB4-5) taken beneath the

parking lot at the facility. Elevated concentrations in both borings were found around 30 feet bgs with individual VOCs (1,1,1-TCA) up to 510ppm (CDM, 2000 RI 3-14) and PNAs, such as naphthalene, up to 3 ppm (CDM, 1995 RI 4-40). The highest concentration of an individual pesticide compound in the subsurface was .005 ppm (CDM, 1995 RI 4-40). Inorganic compounds were detected in Area 4 at levels below background.

Groundwater

Significant groundwater contamination exists beneath and down gradient of Area 4. Elevated levels of 1,1,1-TCA and TCE were identified in wells down gradient of the facility at concentrations of 1 ppm and .02 ppm respectively. The potential pathways of contaminant migration include groundwater and void spaces in soils (e.g. soil gas). As noted previously, soil gas concentrations of 1,1,1-TCA in the immediate vicinity of Area 4 range from below detection limits to 7.2 ppm (CDM, 2000 RI 3-3). Surface migration of contaminants is not likely, given that most of Area 4 is paved.

Non-Aqueous Phase Liquid

Soil boring SB4-202 taken in the northern part of Swebco's parking lot tested positive for the presence of a *light non-aqueous phase liquid* (LNAPL) directly above and within the top portion of the saturated zone. SB4-204 is believed to be right at the source of the area's contamination and contained 510 ppm of 1,1,1-TCA. Light non-aqueous phase liquid was found present at the source from 27- 35 feet bgs and was not found in deeper portions of SB4-202. (CDM, 2000 RI 3-14) Soil boring SB4-202 encountered a low permeability clay layer from approximately 62 feet bgs through 65 feet bgs where the boring was terminated. In most cases, compounds found at Area 4 are considered to be *Dense Non-Aqueous Phase Liquids* (DNAPL's). The physical and chemical properties of DNAPL compounds cause them to sink through the groundwater until geologic material with a low permeability (such as clay) is encountered. However, DNAPLs do not always present themselves as phase separate from water and the presence of other less-dense solvents may change the DNAPL compound's behavior in the subsurface (USEPA, *Groundwater*). Visual examination and *headspace analysis* on soil samples obtained directly above the clay layer did not exhibit DNAPL presence (CDM, 2000 RI App. B).

TABLE 1

NOTES:

ppm - Parts per million or milligrams per kilogram
ppb - Parts per billion or micrograms per liter
MCL- Maximum Contaminant Level developed pursuant to Safe Drinking Water Act
BDL- Below detection limit of laboratory instruments or methods
NA - Compound was not analyzed or measured in laboratory
J - Value is estimated based on laboratory results

1) Only compounds that exceed Tier 1 screening level in soil or an MCL in groundwater are included in Table. Compounds in **bold** text are contaminants of concern for soil, and associated remediation objectives shall be attained through remediation. Remediation objectives shown for all other compounds are only for informational purposes. See section entitled "Remedial Action Objectives" for details.
2) Remediation Goal is the Tier 1 residential screening level for soil for direct contact.
3) Remediation Goal Calculated using equation R15 of TACO that takes attenuation into account.
4) Only Tier 1 residential screening levels for soil for direct contact are considered for semivolatiles because semivolatiles are not currently groundwater contaminants and are not expected to become groundwater contaminants.
5) Compound will be evaluated further through sampling during *remedial design*. Although compound exceeds Tier 1 residential screening level for soil for direct contact, it is not considered a chemical of concern at this time because semivolatiles' are prevalent in environment and not found in groundwater.
6) 95% Upper Confidence Limit on background concentrations
7) Upper Tolerance Limit on site-specific beryllium background concentrations.

Source Area Seven

General Description

Source Area Seven (Area 7) is located in the most southeastern portion of the Southeast Rockford Superfund Site, northwest of the intersection of Alpine and Sandy Hollow Road. Specifically, Area 7 is located at the eastern end of Balsam Lane. Figure 3 on page 13 shows Area 7. The area contains Ekberg Park, a municipal park owned and maintained by the Rockford Park District. The park consists of open grassland, paved tennis and basketball courts, a children's playground, and a parking area. The park is zoned residential and the City's future plans are consistent with current use (Dust). Area 7 also includes privately owned agricultural land and wooded areas to the south and north of the park (Dust). Surface water drainage at Area 7 follows the area's topography which slopes downward from south to north. Two small valleys merge at the base of the hillside on the south of the area and feed into an unnamed creek that boarders the north side of the site. Residential areas border the area to the east and west.

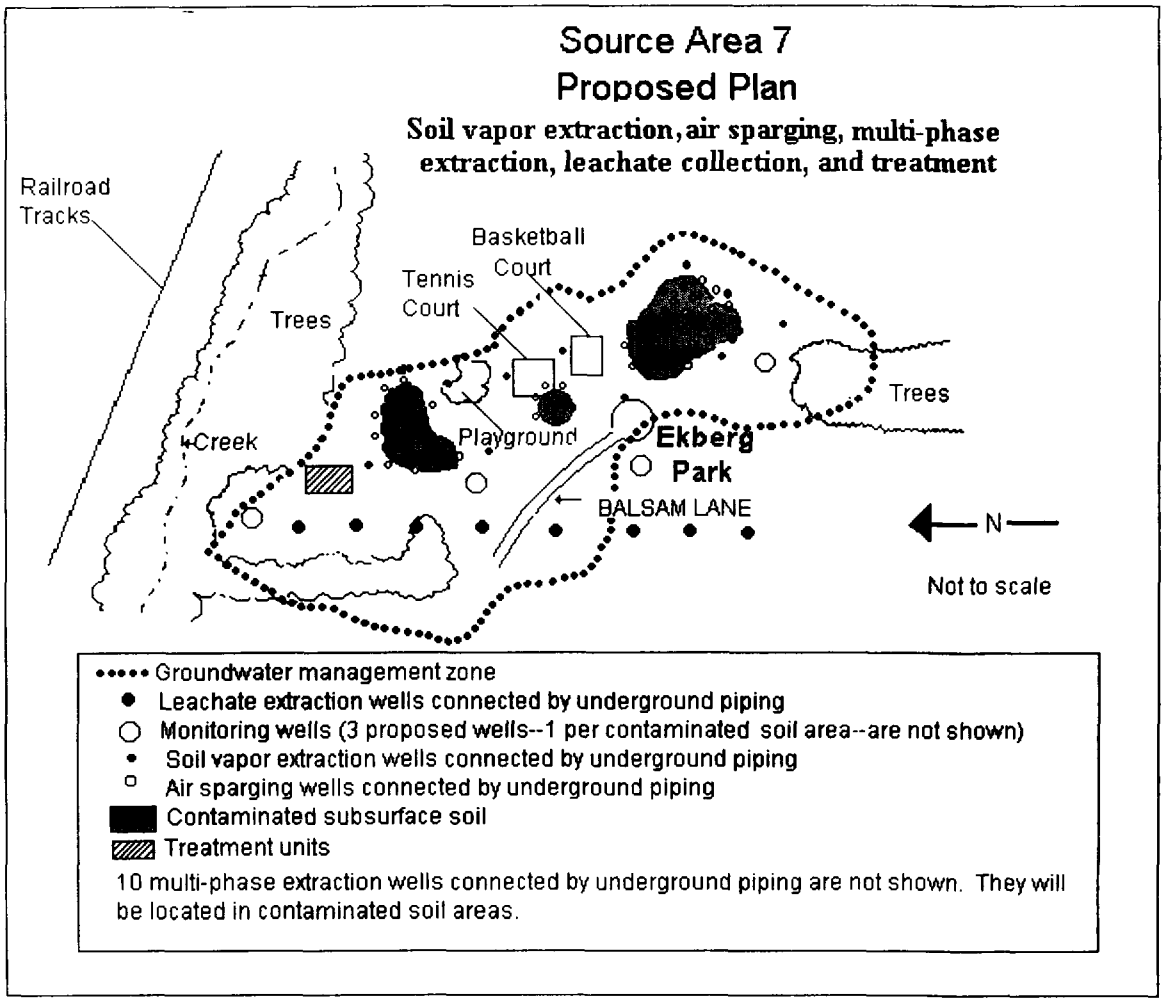
Elevated concentrations of VOCs in monitoring well number 106 (MW106) and aerial photographs showing ground surface excavations helped to identify Area 7 as an area of concern (CDM, 1995 RI 4-12). Part of Area 7 was once a gravel pit as shown on historical maps compiled by the United States Geological Survey. Examination of aerial photographs since the 1950's identifies areas of excavation and disturbed ground east of the end of Balsam Lane. In addition, U.S. EPA has received reports of illegal dumping in the area in the past. (CDM, 2000 RI 1-5).

The geology at Area 7 consists of a heterogeneous combination of sands, silts, and clays that overlie dolomite bedrock. The heterogeneous nature of the geology at Area 7 correlates well with reports of past activities such as quarrying and land filling. Groundwater in both the surficial and bedrock aquifer flows in a northwest direction. Depth to groundwater ranges from 36 feet at MW135 located south of the park, to 13 feet in MW134 within the park, to less than 2 feet in MW105 near the creek. (CDM, 1995 RI Table 3-3)

Soil Gas and Indoor Air

Soil gas surveys completed in May 1992 and February 1993 identified 1,1,1-TCA, PCE and TCE at levels ranging up to 3.8ppm, 1.1ppm, and .690ppm respectively (CDM, 1995 RI 4-14, and 17). The highest concentration for the sum of 1,1,1-TCA, PCE and TCE concentrations in soil gas was 5.59ppm obtained south of the basketball courts (CDM, 1995 RI 4-15). Soil gas data obtained in 1996 identified concentrations for the sum of 1,1,1-TCA, PCE and TCE ranging up to 460ppm in areas north of the children's playground; however, the 1996 data were generated using different procedures than those used in 1992 and 1993.

Residential air sampling in the vicinity of Area 7 identified levels of 1,1,1-TCA, TCE, and PCE, but at levels less than those found in homes near Area 4. As with Area 4, results



could not be directly correlated with groundwater contamination. Concentrations for most compounds were **FIGURE 3** below that of indoor air studies conducted in other cities, and all were below health-based air guidelines in place in 1995 (CDM, 1995 RI 4-85, 90).

FIGURE 3

As with Area 4, U.S. EPA and Illinois EPA compared existing indoor air data from homes near Area 7 to the new indoor air screening values recently established by U.S. EPA Region 9. Upon re-evaluation of existing indoor air data from homes near Area 7, U.S. EPA and Illinois EPA have decided to conduct new indoor air analysis in homes near Area 7 to ensure that concentrations are below levels of concern. Illinois EPA plans to conduct the indoor air analysis during the design of potential remediation. Illinois EPA and U.S. EPA will begin planning the indoor air sampling program as soon as possible. Because of the complicated nature of indoor air sampling, actual fieldwork may not begin until sometime in 2001.

Test Pits

Three test pits were excavated in Area 7 in June 1993. The test pits (large holes dug for investigation purposes) revealed metal cans, other metal objects, glass bottles, and miscellaneous trash. Soil samples taken from the test pits identified PCE ranging up to 22ppm, 1,1,1-TCA up to 4ppm, and up to 3ppm TCE. (CDM, 1995 RI 4-25). Table 2 located on page 15 identifies concentrations of contaminants of concern found in Area 7 soils and groundwater. Soil samples from each test pit were also analyzed for Toxicity Characteristic Leaching Procedure (TCLP). Concentrations in the TCLP soil sample from test pit 2 exceeded the TCLP regulatory level for TCE and PCE at concentrations of 1.1ppm and .7ppm respectively (CDM, 1995 RI 4-26).

Surface Soil

Surface soil samples identified the presence of VOCs, PNAs, metals, and pesticides in surface soils. Surface soil concentrations of VOCs, which are the contaminants of primary concern, ranged up to .22ppm of 1,2-Dichloroethylene (1,2-DCE), .04ppm of 1,1,1 -TCA, .14 of TCE, and .4ppm PCE (CDM, 1995 RI 4-32). One PNA, bis(2-ethylhexyl)phthalate was detected in all surface samples and could be either due to laboratory contamination or plastics disposed of at the site (CDM, 1995 RI 4-32). With the exception of bis(2-ethylhexyl)phthalate, only two surface soil samples contained concentrations of PNAs, most notably benzo(a)pyrene at levels up to .17ppm. Metals concentrations in surface soils at Area 7 exceeded nationwide background concentrations for beryllium and thallium. Pesticide concentrations in surface soils are likely due to the agricultural activities in the area (CDM, 1995 RI 4-32).

Sub-surface Soil

Twenty-four soil borings were conducted at Area 7 in order to characterize the nature and extent of contamination below ground surface in areas that were identified by soil gas and surface soil analysis (CDM, 1995 RI 4-43). The VOCs identified most often were TCA, PCE, and xylene. The VOC 1,1,1-TCA was found at concentrations of 360ppm from 4 -6 feet (depth 4 - 6 feet) in sample SB7-24A, and 380ppm (depth 15-17 feet) in sample SB7-8D (CDM, 1995 RI 4-43). PCE was identified at levels ranging up to 260ppm in sample SB7-8D. Xylene was identified at concentrations ranging up to 210ppm in SB7-10A (CDM, 1995 RI 4-43) .

TABLE 2

Area 7 Contaminant Concentration Ranges and Preliminary Remediation Goals

Contaminant[1]	SOIL (ppm)					GROUNDWATER (ppb)	
	Concentration Range in Soil		Remediation Goals[2]			Concentration	MCL
	Above 10 feet	Below 10 feet	Proximal	Distal	Area-wide		
Volatile Organics							
Benzene [3]	BDL	BDL-0.22	0.03 [4]	0.03 [4]	0.8		
Chloroform [3]	BDL	BDL-0.57	0.0006 [4]	0.0006 [4]	0.3	BDL-23	
Chlorobenzene [3]	BDL	BDL-1.6	1.0 [4]	1.0 [4]	130		
1,1-Dichloroethene	BDL-0.003	BDL-**1.3**	0.06 [4]	0.06 [4]	700	BDL-**180J**	7
1,2-Dichloroethane	BDL-0.008	BDL-0.18	0.02 [4]	0.02 [4]	0.4	BDL-**13**	5
1,2-Dichloroethene(total)	BDL-**49.0**	BDL-**47.0**	0.941 [5,6]	11.582 [5,6]	1200	BDL-**5,900**	170 [6]
Ethylbenzene	BDL-26.0	BDL-31.0	57.347 [5]	144 [7]	400	BDL-**31,000**	700
Methylene Chloride	BDL-0.03	BDL-0.01	1695 [7]	1695 [7]	13		
Tetrachloroethene	BDL-**110.0**	BDL-**260.0**	1.465 [5]	94 [7]	11	BDL-**1,200**	5
Toluene	BDL-23.0	BDL-23.0	255 [7]	255 [7]	650	BDL- 170	1,000
1,1,1-Trichloroethane	BDL-**360.0**	BDL-**460.0**	108.033 [5]	499 [7]	1200	BDL-**8,000**	200
1,1,2-Trichloroethane	BDL-0.004	BDL-0.46	0.619 [5]	56.315 [5]	1800	BDL	5
Trichloroethene	BDL-**24.0**	BDL-**130.0**	0.310 [5]	7.220 [5]	5	BDL-**650**	5
Vinyl Chloride	BDL	BDL	0.01 [4]	0.01 [4]	0.03	BDL-**75**	2
Xylenes (total)	BDL-**210.0**	BDL-**190.0**	119 [7]	119 [7]	410	BDL -1,100	10,000
Semivolatile Organics							
2,4-Dinitrotoluene [8]	BDL- 1.50	BDL	0.162 [5]	80.9 [5]	0.9	NA	NA
Metals							
Beryllium	0.13-0.66	NA	NC	NC	1.51 [9]	NA	NA
Pesticides							
Dieldrin [8]	BDL-0.036	BDL-0.002	NC	NC	0.004 [4]	NA	NA

NOTES:

ppm - Parts per million or milligrams per kilogram
ppb - Parts per billion or micrograms per liter
MCL- Maximum Contaminant Level developed pursuant to Safe Drinking Water Act
J - Value is estimated based on laboratory results

BDL- Below detection limit of laboratory instruments or methods
NA- Compound was not analyzed or measured in laboratory
NC- Remediation objective not calculated

1) Only compounds that exceed Tier 1 screening level in soil or an MCL in groundwater are included in Table. Compounds in **bold** text are contaminants of concern for soil, and associated remediation goals shall be attained through remediation. Remediation objectives shown for all other compounds are only for informational purposes.

TABLE 2 notes (continued)

2) Remediation goal split into three goals. Two are for protection of groundwater for two different "*hot spots*": Proximal is the hot spot closest to the *Groundwater Management Zone* boundary while distal is the hot spot farther away. The third remediation goal is for direct contact with soil, and applied to all of Area 7.

3) Benzene, chloroform and chlorobenzene are not considered chemicals of concern because they were only detected in a small percentage of soil samples (less than 2%).

4) Remediation goal is the Tier 1 residential screening level for soil for protection of groundwater.

5) Remediation goal calculated using equation R15 of TACO that takes attenuation into account.

6) No MCL is available for 1,2-Dichloroethene (total). Therefore, MCL for cis-1,2-Dichloroethene is used to calculate soil remediation objectives as well as evaluate groundwater contamination.

7) *Soil Saturation Limit* used. TACO stipulates that remediation goals can not exceed the soil saturation limit. Therefore, when equation R15 of TACO generated a remediation objective greater than the saturation limit, the saturation limit is used instead.

8) 2,4-Dinitrotoluene and Dieldrin not included as a chemical of concern because they were not found in the groundwater. 2,4- Dinitrotoluene was detected in one out of three soil samples at concentrations above its Tier 1 residential screening level for ingestion. However, 2,4-Dinitrotoluene was not included as a chemical of concern for the following reasons: the concentration for 2,4- Dinitrotoluene was estimated; it was only detected at five feet below the ground surface; and, it was only detected in 1 out of 3 samples. The sample containing 2,4-Dinitrotoluene is within a hot spot to be addressed by proposed alternatives.

9) Site specific background value. For beryllium, the value is the Upper Tolerance Limit on background data.

Subsurface sampling results from past investigations identify three primary VOC source areas ("*hot spots*") at Area 7. Figure 3 identifies the three hot spots located at Area 7. Notable concentrations of total VOCs in the hot spot located at the southern portion of Area 7 (the "southern hot spot") at the confluence of the surface water drainage ditches, extends from approximately 4 to 28 feet bgs. Significant concentrations of total VOCs in this area include: 441ppm in SB7-14 at 4 feet bgs; 1,019ppm in SB7-8 at 15 feet bgs; and 357ppm in SB7-9 at 20 feet bgs (CDM, 1992 RI Figure 4-19). Notable concentrations of total VOCs in the hot spot located just west of the tennis courts (the "central hot spot") extend from approximately 19 to 23 feet bgs. Concentrations of total VOCs in the central hot spot include 35ppm in SB7-4 at 20 feet bgs (CDM, 1995 RI Figure 4-19). Lastly, significant concentrations of total VOCs were identified in the northern portion of Area 7, north and west of the playground area (the "northern hot spot"). Total VOC concentrations in the northern hot spot include: 627ppm in SB-24 at 4 feet bgs; 17ppm in SB7-202 at 11 feet bgs; and 875ppm in SB7-201 at 25 feet bgs (CDM, 1995 RI Figure 4-19). Significant contamination in the northern hot spot ranges from 3 to at least 28 feet bgs. The depth to which contamination extends in this area was not determined (the soil boring was terminated upon encountering a clay layer rather than risk spreading contamination deeper) (CDM, 1995 RI 3-20).

Non-Aqueous Phase Liquid

Subsurface sampling results for VOCs that were obtained during the OU2 RI suggest the presence of NAPL in the northern and southern hot spots in Area 7.
Specific tests designed to positively identify NAPL were not performed on soils in the southern hot spot. The investigation of this hot spot was conducted largely during the OU2 RI and work plans did not provide for specific tests for NAPL presence. However, PCE concentrations found in soil sample SB7-8D taken from soil boring SB7-8 suggest the presence of a NAPL (CDM, 1995 RI 4-48). The boring log also indicates an elevated headspace and a strong solvent odor for sample SB7-8D (CDM, 1995 RI Appendix A). Based on density, PCE detected within this sample would be expected to be present as a DNAPL. DNAPLs are also known as "sinkers" because if they are present at high concentrations they will sink in groundwater rather than floating on top of the *water table*. However, VOCs that are less dense than PCE, such as xylene, naphthalene, and 2-methyl naphthalene were also identified within soil boring SB7-8 at concentrations high enough to exist as NAPL (CDM, 1995 RI 4-48). At higher concentrations, these compounds would usually present themselves as an LNAPL and would float on or near the top of the water table rather than sink. Headspace analysis noted in the boring log for SB7-8 shows the highest readings (130ppm) at 15 feet bgs, just below the approximate depth at which the water table was encountered (CDM, 1995 RI Appendix A). Headspace analysis drops to 60ppm at 25 feet bgs, and 11ppm at 45 feet bgs where the boring was terminated. The decrease in headspace analysis with depth away from the water table indicates that if a NAPL were present in this hot spot, it would likely present itself as an LNAPL. The decrease in headspace analysis with depth also helps to discount the presence of a DNAPL at this area although it can not be ruled out.

The northern hot spot was investigated during the OU3 and the work plan provided for testing designed to identify NAPL. Analysis performed on soil samples obtained in the northern hot spot within Area 7 positively identified NAPL. Soil Borings SB7-201 and SB7-202 were conducted within the northern hot spot. A total VOC concentration of 875ppm was identified in the soil sample taken from SB7-201 at 25 feet bgs. NAPL in soils from 25 to 27 feet bgs from SB7-201 was identified visually. In addition, a shaker dye test was performed that confirmed the presence of NAPL from 25 - 27 feet bgs. SB7-201 was terminated at 27 feet after the boring encountered a clay layer. (CDM, 1995 RI 4-48)

Many of the compounds detected in the sample obtained from 25 - 27 feet bgs in the northern hot spot are commonly associated with DNAPLS (USEPA, *Groundwater*). Additionally, the presence of free product approximately 13 feet below the water table and directly above an impermeable clay layer are indicative of DNAPL.

Concentrations of total VOCs in the central hot spot located just west of the tennis courts are not indicative of NAPL as evidenced by soil boring SB7-4 which was advanced within the central hot spot. Concentrations of total VOCs in the central hot spot include 35ppm in SB7-4 at 20 feet bgs (CDM, 1995 RI Figure 4-19). Using

conservative assumptions, concentrations of detected compounds within sample SB7-4E, do not approach their solubility limits. In addition, the soil boring log does not mention visual staining or odors at any depth within the boring (CDM, 1995 RI Appendix A). Headspace analysis results indicate that the most highly contaminated zone within SB7-4 is 20 feet bgs (approximately 10 feet below the water table), and headspace analysis results decrease down to zero at 37 feet bgs helping to rule out the possibility for DNAPL (CDM, 1995 RI Appendix A).

Groundwater

Groundwater samples taken from monitoring wells MW135 and MW106A, located down gradient from Area 7, had concentrations of 1,1,1-TCA at 8ppm and 7.9ppm respectively. Other VOCs detected in the groundwater down gradient of Area 7 include: PCE, TCE, 1,2-DCE (total), vinyl chloride, and ethyl benzene. Table 2 identifies concentrations of primary contaminants of concern identified within the groundwater near Area 7.

Surface Water and Sediment

In June of 1996, samples were taken from surface water and sediments in the unnamed creek at the north end of Area 7 to determine if past activities in the area had affected the creek. Figure 4 on page 19 shows Area 7 surface water and sediment sampling locations. Four creek sediment samples were obtained during the OU3 RI. Only one VOC, 1,2-dichloropropane (1,2-DCP) was identified within the sediment. Concentrations of 1,2-DCP ranged up to .007ppm (CDM, 2000 RI 3-22). Several PNAs were detected in every sediment sample: fluoranthene, pyrene, benzo(a)anthracene, and chrysene (CDM, 2000 RI 3-26). Pesticides and PCBs were also detected in the creek sediment

Three surface water samples were obtained from the creek. Six VOCs were detected, 1,1,1-TCA, TCE, 1,1-DCA, 1,1-DCE, 1,2-DCE and chloroethane. There was no discernable pattern in the distribution of contaminants detected in surface water samples. Total VOCs were identified at .09ppm upstream as compared to .065ppm downstream. Total VOCs in surface water at the confluence of the surface water drainage ditch and the unnamed creek was .111ppm (CDM, 2000 RI 3-26).

On December 16, 1998, Illinois EPA obtained additional samples of the surface water and sediments within the creek. The objective of the sampling event was to provide more information regarding the type and source of the contaminants. A total of six samples were taken from the creek: two sediment samples and four surface water samples. Sampling locations for this event are also identified within Figure 4 on page 19. Results from the December 1998 sampling event identified several compounds that were not detected during the 1996 investigation (Takacs). Higher concentrations of several compounds that had been detected previously were identified (Takas). Table 3 on page 20 summarizes the concentrations of contaminants identified in the sediment during both the 1996 and 1998 investigations. Table 4 on page 22 summarizes the

concentrations of contaminants identified in the surface water during both the 1996 and 1998 investigations.

FIGURE 4

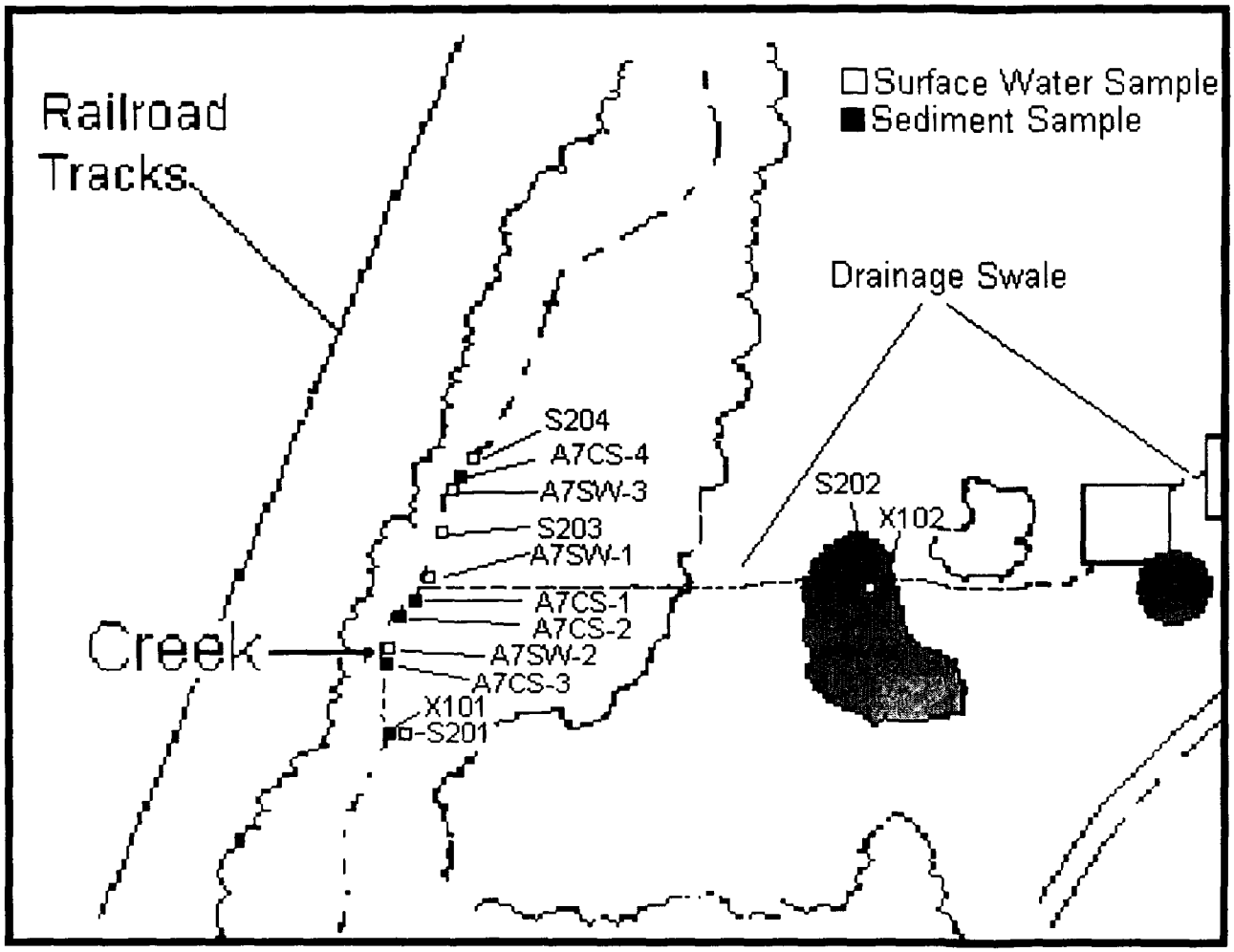


TABLE 3

Area 7 Creek Sediment Concentrations and Ecological Benchmarks (mg/kg)

Analyte	Sample Locations						Benchmark
	X102	A7CS-4	A7CS-1	A7CS-2	X101	A7CS-3	
Naphthalene (A)	ND	ND	ND	ND	**0.063** (1)	ND	0.0346 (2,3)
Acenaphthene (A)	ND	ND	ND	ND	**0.170**	ND	0.00671 (2,3)
Dibenzofuran (A)	ND	ND	ND	ND	0.091	ND	-
Fluorene (A)	ND	ND	ND	ND	0.180	ND	0.010 (4)
Anthracene (A)	ND	ND	ND	ND	0.240	ND	0.03162 (5)
Carbazole (A)	ND	ND	ND	ND	0.310	ND	-
Fluoranthene (B)	ND	0.590	0.240 J	0.092 J	1.600	0.120 J	0.03146 (4)
Pyrene (B)	ND	0.140 J	0.086 J	0.042 J	1.300	0.100 J	0.04427 (4)
Benzo(a)anthracene (B)	ND	0.230 J	0.120 J	0.038 J	0.690	0.054J	0.0317 (2)
Chrysene (B)	ND	0.270 J	0.130 J	0.044 J	0.740	0.069 J	0.02683 (4)
Benzo(b) fluoranthene (B)	ND	0.510 X	0.250XJ	.0.094 XJ	0.870	0.120XJ	-
Benzo(a)pyrene (B)	ND	**0.054 J**	ND	ND	0.590	ND	0.0319 (2)
Indeno(1,2,3-cd) pyrene (A)	ND	ND	ND	ND	0.440	ND	0.01732 (4)
Dibenzo(a,h)anthracene (A)	ND	ND	ND	ND	0.110	ND	0.00622 (2,3)
Benzo(g,h,i)perylene (A)	ND	ND	ND	ND	0.390	ND	0.170 (6)
Di-n-butylphthalate (A)	0.110	ND	ND	ND	ND	ND	-
Chloromethane (A)	ND	ND	ND	ND	.013	ND	
Vinyl chloride (A)	0.028	ND	ND	ND	ND	ND	-
Chloroethane (A)	0.014	ND	ND	ND	ND	ND	-
Acetone (A)	0.029	ND	ND	ND	.014	ND	-
1,1-Dichloroethane (A)	0.110	ND	ND	ND	ND	ND	-
1,2-Dichloroethane (total) (A)	0.190	ND	ND	ND	ND	ND	-
1,1,1-Trichloroethane (A)	0.062	ND	ND	ND	ND	ND	-
Heptachlor epoxide (A)	ND				**0.0026**		0.00060 (2)
Barium (A)	101.00	--	--	--	16	--	-
Calcium (A)	8530	--	--	--	29100	--	-
Cobalt (A)	5.10	--	--	--	ND	--	-
Iron (A)	13400.00	--	--	--	6690	--	-
Potassium (A)	1320.00	--	--	--	ND	--	-
Magnesium (A)	5210	--	--	--	14400	--	-
Sodium (A)	551.00	--	--	--	247	--	-
Lead (A)	**88.90**	--	--	--	ND	--	30.20 (3)
Vanadium (A)	31.20	--	--	--	12.1	--	-

TABLE 3 Notes

Notes:

A Compound not evaluated in March 1999 Ecological *Risk Assessment* and exceeds existing screening benchmark or no benchmark exists

B Compound detected at concentration higher than that which was evaluated in March 1999 Ecological Risk Assessment

1 Concentrations shown in **bold** exceed *ecological screening benchmark*

2 Canada interim = Canadian Sediment Quality Guidelines for the Protection of Aquatic Life - Interim Freshwater Sediment Quality Guidelines (ISQGs) http://www.ec.gc.ca/ceqg-rcqe/sediment.htm

3 Florida threshold = Florida Department of Environmental Protection, Office of Water Policy - Sediment Quality Assessment Guidelines (SQAGs) Threshold Effect Levels http://www.dep.state.fl.us/dwm/documents/sediment/default.htm (Table 5, p.77)

4 NOAA lowest threshold = National Oceanic and Atmospheric Administration Screening Quick Reference Tables (SQUIRTs) - Freshwater Sediment Lowest ARCs *H. azteca* Threshold Effect Level (TEL) http://response.restoration.noaa.gov/living/SQuiRT/SQuiRT.html

5 ARCS probable = Assessment and Remediation of Contaminated Sediments (ARCS) Program of National Biological Service for USEPA Great Lakes National Program Office - Probable Effect Concentration (PEC) http://www.hsrd.ornl.gov/ecorisk/reports.html (sediment report, Table 4, p.17)

6 Ontario low = Ontario Ministry of the Environment - Lowest Effect Level http://www.hsrd.ornl.gov/ecorisk/reports.html (sediment report, Table 4, p.17)

TABLE 4

Surface Water Contaminant Concentrations and Ecological Screening Benchmarks (ug/L)

	Sample Locations							
Analyte	S202	S204	A7SW-3	S203	A7SW-1	A7SW-2	S201	**BENCHMARK**
bis(2-Ethylhexyl) phthalate (A)	ND	ND	ND	13.00	ND	ND	ND	-
Vinyl chloride (A)	48 J	ND	ND	ND	ND	ND	ND	-
Chloroethane (B)	87 J	ND	10	ND	ND	ND	ND	-
Acetone (A)	ND	ND	ND	ND	ND	ND	17.00	-
1,1-Dichloroethene (B)	88	ND	ND	ND	1 J	ND	ND	-
1,1-Dichloroethane (B)	1300.00	ND	30	ND	19	13	ND	-
1,2-Dichloroethene (B)	2200.00	ND	42	ND	54	31	ND	-
Chloroform (A)	10.00	ND	ND	ND	ND	ND	ND	-
Trichloroethene (B)	22.00	ND	1J	ND	1J	ND	ND	-
Xylene (total) (A)	21.00	ND	ND	ND	ND	ND	ND	-
Aluminum (A)	6310	27900.00	--	**7770**	--	--	42.8	5-100.00 ('
Chromium (A)	7.4	**46.90** (7)	--	14.0	--	--	ND	11, 74 (5)
Copper (A)	9.6	84.90	--	**43.2**	--	--	ND	9.00 (5)
Iron (A)	9946	527000	--	**251000**	--	--	**6650**	1000.00 (5)
Lead (A)	11.5	108	--	**54.4**	--	--	ND	2.50 (5)
Antimony (A)	ND	**7**	--	**3.7**	--	--	ND	3.0 (6)
Zinc (A)	49	**340**	--	**193**	--	--	7.6	120.00 (5)

Notes:

A Compound not evaluated in March 1999 Ecological Risk Assessment and exceeds existing screening benchmark or no benchmark exists

B Compound detected at concentration higher than that which was evaluated in March 1999 Ecological Risk Assessment

1 Concentrations in **bold** exceed ecological screening benchmark

2 Illinois EPA Water Quality Criteria

3 Canada = Canadian Water Quality Guidelines for the Protection of Aquatic Life - Freshwater Water Quality Guidelines http://www.ec.gc.ca/ceqg-rcqe/water.htm

4 NOAA = National Oceanic and Atmospheric Administration Screening Quick Reference Tables (SQUIRTs) - Freshwater Acute http://response.restoration.noaa.gov/living/SQuiRT/SQuiRT.html

5 AWQC = USEPA - Ambient Water Quality Criteria Freshwater Criterion Continuous Concentration (CCC) National Recommended Water Quality Criteria - Correction EPA 822-Z-99-001 April 1999. For chromium, 11ug/L and 74ug/L are the criteria for Chromium +3, and Chromium +6, respectively.

6 NOAA = National Oceanic and Atmospheric Administration Screening Quick Reference Tables (SQUIRTs) - Freshwater Chronic http://response.restoration.noaa.gov/living/SQuiRT/SQuiRT.html

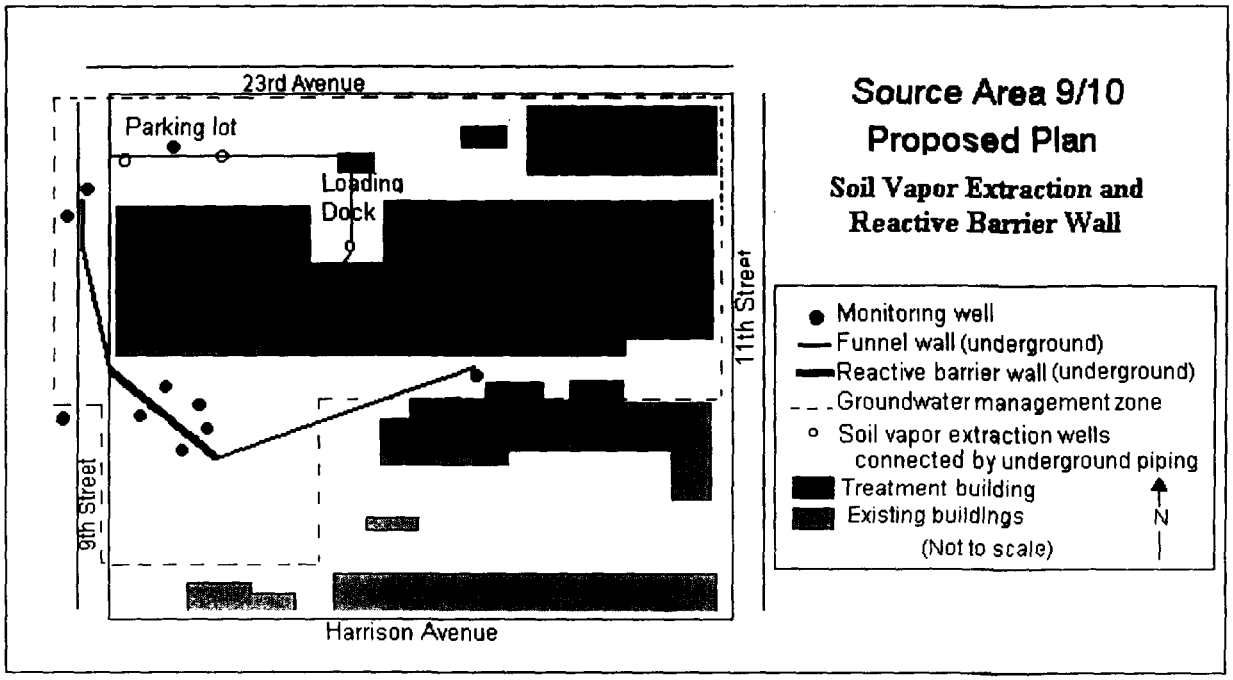
7 Concentration is for Chromium +3

Source Areas Nine and Ten ("Area 9/10")

General Description

Source Areas Nine and Ten have been combined and evaluated together as "Area 9/10". Area 9/10 is an industrial area that is bounded by Eleventh Street on the east, Twenty-third Avenue on the north, Harrison Avenue on the south, and sixth street on the west. The properties to the immediate north of Area 9/10, across Twenty-third Avenue, are residential and are zoned as such. South of Area 9/10, across Harrison Avenue, properties are used for both commercial and residential purposes. Area 9/10 is zoned as light industrial, while the properties to the south are zoned mixed residential and commercial (Dust). Future uses planned by the City of Rockford for Area 9/10 and adjacent properties are consistent with current uses (Dust). Figure 5 provides graphical information for Area 9/10. Problems regarding site access and concern over underground utilities at Area 9/10 have limited past investigations and their ability to provide complete and accurate information about the sources located in this area.

FIGURE 5



Area 9/10 has a history of industrial activity that extends back as far as 1926 when the Rockford Milling Machine and Rockford Tool companies merged to become the Sundstrand Machine Tool Company, located at the northwest corner of Eleventh Street and Harrison Avenue (Lunden). Current industries that operate in the area include Sundstrand Corporation's Plant #1, Nylint Corporation, Paoli Manufacturing, Rockford Products Corporation,, and J.L. Clark. Mid-States Industrial Company (also known as Rockford Power Machinery) and Rohrbacher Manufacturing were also primary facilities in the area but are no longer in operation (CDM, 2000 RI 1-7, 3-55).

The geology at Area 9/10 is unconsolidated sand and gravel to a depth of at least 101 feet bgs as determined by SB9/10-201. No clay or silt units were encountered (with the exception of some fill material within 8 feet of the ground surface) in the borings conducted by CDM for the Operable Unit 3 investigation. Information from boring logs for two borings conducted near the intersection of Ninth and Harrison Avenue indicate that the unconsolidated sand and gravel in Area 9/10 continues to approximately 235 feet bgs where bedrock is encountered. One of the boring logs from Illinois State Geological Survey well records identifies a till unit from 120 to 130 feet bgs. Borehole drilling just west of Area 9/10 at the intersection of Twenty-third Avenue and Fourth Street indicated that the unconsolidated sediments are at least 169 feet thick, with a 12 foot-thick clay unit from 132 to 144 feet bgs. The water table at Area 9/10 is generally encountered between 30 and 35 feet bgs. (CDM, 2000 RI 3-55, 57)

Investigation results, summarized below, indicate that significant sources of VOC contamination exist within Area 9/10. Four primary potential source locations within Area 9/10 were investigated and are discussed below.

Sundstrand Plant #1

Available information regarding Sundstrand Plant #1 (Illinois EPA *104e Requests*; Harding Lawson Associates 1992) documents the existence of three potential source areas at the facility: 1) the Outdoor Storage Area; 2) the loading dock; and 3) the Waste Recycling Area. The Outdoor Storage Area which was formerly located at the southwest corner of the Sundstrand parking lot (Ninth Street and Twenty-third Avenue) was used to store VOC bearing materials and soils in this vicinity had elevated VOCs. Additionally, and underground storage tank (UST) adjacent to the Outdoor Storage Area was used to store VOCs. The loading dock at Plant #1 has contained approximately 14 USTs at various times between 1962 and 1987. The USTs had a variety of contents, including solvents, cutting oils, fuel oils and jet fuel. The third potential source at Sundstrand's Plant #1, the Waste Recycling Area is located inside the facility, and *up gradient* of the west end of the Nylint building. (CDM, 2000 RI 3-75, 76)

Mid-States Industrial

A drum storage area at the Mid-States Industrial facility (formerly Rockford Power machinery) is another potential source at Area 9/10. Trichloroethene was identified in the shallow soils in this vicinity up to 67ppm (Fehr-Grahm Associates 1989).

Nylint

Investigations conducted during the OU3 RI at the property leased by Nylint found high 1,1,1-TCA concentrations in soil gas at the west end of the building, suggesting a potential nearby source. Soils samples from the area did not detect elevated VOCs, indicating that soil gas is either migrating from an adjacent area where soil samples were not collected, or that volatilization from the groundwater is responsible for observed soil gas concentrations. (CDM, 2000 RI 3-76)

Rockford Products

Elevated concentrations of VOCs in soil gas (>1,000ppb) at the Rockford Products facility on Ninth Street indicate that this is a potential source. As with Nylint, soils samples from the area did not detect elevated VOCs, indicating that soil gas is either migrating from an adjacent area, possibly beneath the building, or volatilizing from the groundwater causing elevated soil gas concentrations in the vicinity. It should be noted that the location of elevated soil gas concentrations is down gradient from Sundstrand Plant #1's Outdoor Storage Area. Migration of VOCs from the Outdoor Storage Area and volatilization from the groundwater could be the cause of elevated soil gas concentrations. Information that is currently available is unable to distinguish between a VOC source at Rockford Products or migration from an up gradient

source. (CDM, 2000 RI 3-76)

Soil Gas

The soil gas investigation conducted as a part of the OU3 investigation identified several portions of Area 9/10 with distinctly high soil gas concentrations. The distinct areas are: 1) west and northwest of the Sundstrand plant (i.e. the southeast corner of Twenty-third Avenue and Ninth street); 2) immediately south of the Sundstrand Plant and in the Rockford Product parking lot; 3) immediately north of the Rockford Products building on Ninth Street; 4) at the west end of the Nylint building; 5) at the Mid-States Industrial facility; and 6) the intersection of Ninth Street and Harrison Avenue. Chlorinated compounds detected in soil gas at elevated concentrations include PCE, TCE, 1,1,1-TCA, 1,2-DCE, 1-1-DCA, and vinyl chloride. Non-chlorinated VOCs detected include *BTEX* (benzene, toluene, ethylbenzene, and xylene) compounds which were ubiquitous in small to moderate amounts. Figure 5 includes total VOC results for Area 9/10 detected within soil gas. (CDM OU3 RI 3-57)

The soil gas distribution for PCE indicates the presence of significant concentrations (0.100ppm) on the northwest, west, and southwest sides of the Sundstrand Plant on Ninth Street, as well as in the area just north of Rockford Products, at the intersection of Ninth Street and Harrison Avenue. Trichloroethene concentrations in soil gas greater than 0.100ppm were found at the southwest corner of the Mid-States building, and at the west end of the Nylint building. Concentrations of 1,1,1-TCA were the most significant and pervasive of any soil gas compound in Area 9/10. The largest area of elevated TCA (> 0.100ppm) occurs just south of the west part of Sundstrand Plant #1 and extends south-southwest across Rockford Products parking lot. The distribution of 1,1,1-TCA closely resembles that of total VOC shown on Figure 7. (CDM OU3 RI 3-57)

No indoor air analysis was performed in Area 9/10. This is because the area is mostly industrial and the homes that are in the area appear to be outside of significant areas of groundwater contamination. Also, soil gas concentrations near the homes are low.

Surface Soils

A total of four surface soil samples were obtained in Area 9/10. The only VOC detected was methylene chloride which is a common laboratory contaminant. A total of 20 PNAs were detected, including phenanthrene, fluoranthene, pyrene, and chrysene. Dieldrin and gamma-Chlordane were the pesticides detected most often. Concentrations of metals detected at Area 9/10 were not remarkable. Table 5 summarizes Area 9/10 results from past investigations.

AREA 9/10 Contaminant Concentration Ranges and Preliminary Remediation Goals					
Contaminant[1]	TABLE 5 SOIL (ppm)			GROUNDWATER (ppb)	
	Concentration Range in Soil		Remediation Goal	Concentration	MCL
	Above 10 feet	Below 10 feet			
Volatile Organics					
1,1-Dichloroethene	BDL	0.002	0.06[2]	BDL-**850**	7
1,2-Dichloroethane	BDL	BDL	0.02[2]	BDL-**6** J	5
1,2-Dichloroethene (total)	BDL	BDL	0.4[3]	BDL-**4600**	NA
Ethylbenzene	BDL	BDL	13[2]	BDL-19	700
Methylene Chloride	0.002-0.003	0.003-0.048	0.02[2]	BDL	5
Tetrachloroethene	BDL	0.002-0.046	0.06[2]	BDL-**50** J	5
1,1,1-Trichloroethane	BDL	0.001-0.050	2[2]	BDL-**12,000**	200
1,1,2-Trichloroethane	BDL	0.006	0.02[2]	BDL-**60** J	5
Trichloroethene	BDL	0.001-0.002	0.06[2]	BDL-**140**	5
Vinyl Chloride	BDL	BDL	0.01[2]	BDL-**14**	2
Semivolatile Organics					
Benzo(a)anthracene [4,5]	0.330-**2.30**	BDL	.9[6]	BDL	NA
Benzo (b) Fluoranthene [4,5]	0.420-**2.80**	BDL	.9[6]	BDL	NA
Benzo(a)pyrene [4,5]	0.260-**1.70**	BDL	.3[7]	BDL	NA
Indeno(1,2,3-cd)pyrene [4,5]	0.230-**1.30**	BDL	.9[6]	BDL	NA
Metals					
Beryllium	0.06-0.090	NA	1.51[7]	BDL	4
Pesticides					
Dieldrin [8]	0.004-**0.054**	BDL-0.002	0.004[9]	BDL	NA

NOTES:

ppm - Parts per million or milligrams per kilogram
ppb - Parts per billion or micrograms per liter
MCL- Maximum Contaminant Level developed pursuant to Safe Drinking Water Act

J - Value is estimated based on laboratory results
BDL- Below detection limit of laboratory instruments or methods
NA- Compound was not analyzed or measured in laboratory

1) Only compounds that exceed Tier 1 screening level in soil or an MCL in groundwater are included in Table. Remediation objectives shown for all other compounds are only for informational

purposes.

2) Remediation Objective is the Tier 1 residential screening level for soil for protection of groundwater.

Table 5 notes (continued)

3) Remediation objective for cis-1,2-Dichloroethane, no objective exists for total 1,2-Dichloroethane

4) Only Tier 1 residential screening levels for soil for direct contact are considered for semivolatiles because semivolatiles are not currently groundwater contaminants and are not expected to become groundwater contaminants.

5) Compound will be evaluated further through sampling during remedial design. Although compound exceeds Tier 1 residential screening level for soil for direct contact, it is not considered a chemical of concern at this time because semivolatiles' are prevalent in environment and not found in groundwater.

6) Remediation Objective is the Tier 1 residential screening level for soil for direct contact.

7) Site specific background value. For beryllium, the value is the Upper Tolerance Limit on background data.

8) Dieldrin not included as a chemical of concern because it was not found in the groundwater. Surface concentration is below Tier 1 residential screening level for soil for direct contact.

9) Remediation Objective is the Tier 1 residential screening level for soil for protection of groundwater.

Sub-surface Soils

In areas where access was attainable, analytical results for Area 9/10 sub-surface soils show low concentrations of total VOCs. In soils above the water table, a maximum of 0.050ppm of total VOCs was identified. The only detections of chlorinated VOCs in soil above the water table occurred at the Sundstrand Plant in borings SB9/10-134, SB9/10-135, and SB9/10-137. Tetrachloroethene, methylene chloride, and TCE where the primary chlorinated VOCs detected in soils above the water table. The highest concentration of chlorinated VOCs below the water table was 0.154ppm which was in the soil within the top 10 feet beneath the water table (i.e. 39-41 feet bgs). The primary chlorinated VOCs detected in this sample were 1,1,1-TCA and 1,2 DCE. Table 5 summarizes Area 9/10 results from past investigations. (CDM, 2000 RI 3-61,67)

Groundwater

Groundwater contamination (the plume) emanating from Area 9/10 has the third highest VOC concentrations out all sources investigated during the Southeast Rockford project (CDM, 1995 RI 4-137). Previous investigations have identified Area 7 as having the highest concentrations of groundwater contamination, followed by Area 8, which had the second highest concentrations. The Operable Unit 2 RI determined that groundwater contamination from Area 8 was not contributing to the overall Southeast Rockford groundwater contamination problem, and was dropped from consideration as a part of the superfund site.

Five monitoring wells in Area 9/10 were sampled as a part of the OU3 RI. Volatile Organic Compounds were detected in all five locations. Total VOCs above *detection limits* for two up gradient wells, MW202 and 203 were 0.017ppm and 0.009ppm respectively (CDM, 2000 RI Figure 3-34). Monitoring wells MW-5 and MW-4 were installed on the former Mid-States (formerly Rockford Power Machinery) for a previous study in 1991 (Fehr-Graham & Associates). Total VOCs above detection limits in wells MW-5 and MW-4, which are immediately down gradient of the former Mid-States

building, is 0.028ppm and 0.043ppm respectively. Groundwater samples obtained from monitoring well MW201, installed down gradient of Sundstrand Plant #1 contained 18.27ppm total VOCs above detection limits. Table 5 summarizes Area 9/10 groundwater results from past investigations. (CDM, 2000 RI 3-67, Figure 3-34)

Non-Aqueous Phase Liquid

The concentration of 12ppm of 1,1,1-TCA in MW201 indicates that NAPL is likely present in Area 9/10 based on the aqueous solubility limit of 1,1,1-TCA. Field studies have shown that groundwater concentrations greater than 1% of a contaminant's solubility are strongly indicative of the presence of NAPL (National Research Council). The concentration of 1,1,1-TCA at in MW201 represents 0.8 to 4 percent of its aqueous solubility limit. The source of the dissolved 1,1,1-TCA is located a short distance up gradient (northeast) of the well, between the north end of the Rockford Products parking lot east of 9th Street and the Mid-States Industrial property. Furthermore, given the dominance of chlorinated VOCs, which are more dense than water, it is likely that a DNAPL is present in the vicinity of MW201. Dye testing did not reveal the presence of NAPL in the shallower portions of the unconsolidated aquifer. However, DNAPL would no be expected to be present in the more shallow portions of the aquifer because no confining units are present in the top 100 feet of the aquifer. (CDM, 2000 RI 3-77)

Source Area Eleven

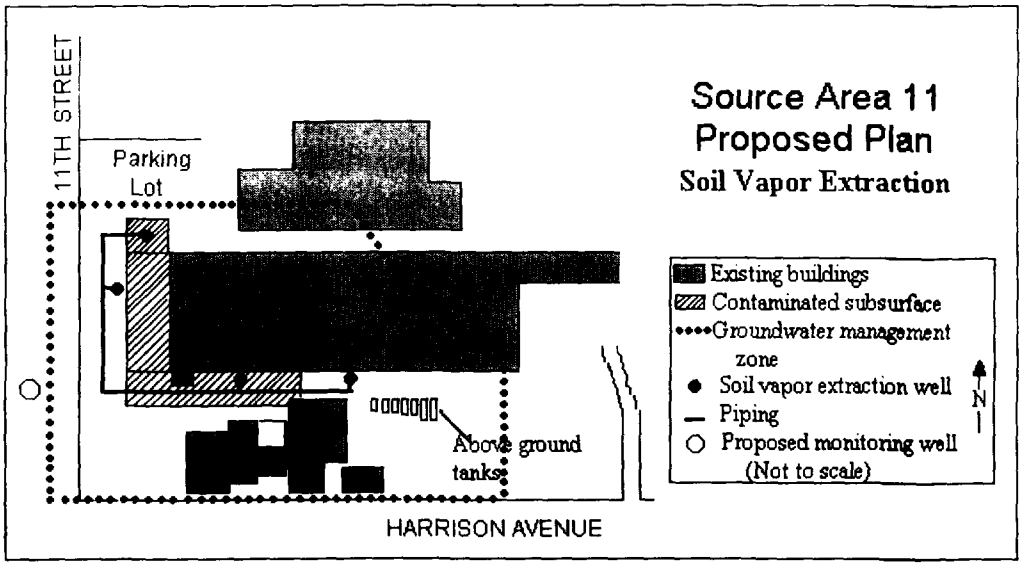
General Description

Source Area Eleven (Area 11) is located east of Eleventh Street at the corner of Eleventh Street and Harrison Avenue. Area 11 is bordered on the east and west by industrial facilities. Properties to the immediate north of Area 11 are industrial while land uses further north (north of Twenty-third Avenue) include industrial mixed with some residences. South of Area 11, across Harrison Avenue, properties are used for both commercial and residential purposes. Area 11 continues to be dominated by industrial activities. Area 11 is comprised of several industrial properties and one commercial property. The Area is zoned light industrial and commercial (Dust). Future uses planned by the City of Rockford are consistent with current uses as light industrial (Dust). Figure 6 provides graphical information for Area 11.

The geology at Area 11 is unconsolidated sand and gravel to a depth of at least 62 feet bgs as evidenced by SB11-202 (CDM, 2000 RI Appendix D). Information from boring logs for two borings conducted approximately one block east of Area 11 near the intersection of Ninth and Harrison Avenue indicate that the unconsolidated sand and gravel in the general area continues to approximately 235 feet bgs where bedrock is encountered (CDM, 2000 RI 3-55, 57). One of the boring logs from Illinois State Geological Survey well records identifies a till unit from 120 to 130 feet bgs (CDM, 2000 RI 3-55, 57). The water table at Area 11 was encountered at approximately 20 - 25 feet bgs during the Operable Unit 2 investigation and closer to 30- 34 feet bgs during the during Operable Unit 3 investigation (CDM, 1995 RI Appendix A, CDM, 2000 RI

Appendix D).

FIGURE 6 -



Area 11 currently includes the Rohr Manufacturing facility (formerly Rockwell Graphics Systems), H and H Wood Products and Pallets, Villa di Roma Restaurant, and adjacent parking lots. Historically, Rockford Varnish, Rockford Coatings, and Rockwell Graphics Systems have conducted manufacturing activities in Area 11. (CDM, 2000 RI 1-6)

The Rockford Coatings Corporation, formerly located at 1620 Harrison Avenue, manufactured several paint products including enamels, lacquers, and water-based paints. The use of chlorinated solvents at the facility is unknown. The Rockford Coatings Corporation discontinued operations in 1983. (CDM, 2000 RI 1-6)

Rockford Varnish Company, formerly located at 11th and Harrison Avenue, manufactured varnish and related products for the furniture industry from 1906 until 1983. Rockford Varnish used VOCs, including chlorinated solvents, in its operations and stored these compounds on-site in approximately eight above-ground storage tanks. Groundwater sampling results near the facility indicate chlorinated solvent contamination. (CDM, 2000 RI 1-6)

Rockwell International Graphics, formerly located at 2524 11th Street, manufactured gears and rollers for newspaper presses until approximately 1991. The facility used 1,1,1-TCA for cleaning rollers until 1983. Areas of concern near the former Rockwell facility include a dumpster located south of Rockwell that apparently leaked cutting oils onto the ground surface and a pit to the north of the property that contained standing water with an oil sheen. The Rockwell facility is now owned by P.H. Partners Co., who

lease it to Rohr Manufacturing. Present operations include painting industrial equipment. (CDM, 2000 RI 1-6)

Several contaminant release and migration pathways exist in Area 11. One potential contaminant source is the eight aboveground storage tanks that previously contained VOCs (including chlorinated solvents) used in operations at the former Rockford Varnish Facility. Potentially leaking tanks and aboveground piping may have released contaminants to the *vadose zone*. A second contaminant source, a bunker, reportedly used by Rockford Varnish Company is located in the railroad right-of-way south of the former Rockwell property. This bunker has previously seeped a tar-like substance. Historical reports indicate that a dumpster used by Rockwell Graphics leaked cutting oils onto the ground surface and that a pit to the north of Rockwell contained standing water with an oil sheen. (CDM, 2000 RI 3-33)

Investigations conducted at Area 11, summarized below, identified two distinct zones of subsurface contamination. One zone is located on the western margin of Area 11 centralized beneath Rohr Manufacturing, and extending area north, south, and west of the building. Soil samples within this zone showed elevated concentrations of toluene, ethylbenzene, xylene, and acetone as well as the presence of NAPL. A second zone of contamination exists near the above ground storage tanks to the northeast of the former Rockford Varnish building. Soil samples in this zone identified elevated concentrations of toluene, xylenes, and PCE. Within both zones of elevated contamination, the high levels of toluene, ethylbenzene, and xylene (often referred to as BTEX), masked lower levels of chlorinated VOCs that were likely present. Table 6 summarizes Area 11 results from past investigations.(CDM, 2000 RI 3-45, 3-51 to 3-53)

Soil Gas

A soil gas survey was conducted at Area 11 during the 1996 OU3 RI to delineate the area extent of VOC impact and identify any hot spots. A total of 54 soil gas samples were collected. Total concentrations of benzene, toluene, ethylbenzene, and xylene (often referred to as BTEX) in the western zone of contamination ranged from 0.041ppb to 2.25ppm. Toluene and xylene are the primary contributors to the total BTEX concentration. Total chlorinated VOCs in the western zone ranged from less than 0.007ppm to 0.077ppm. Primary contributors to total chlorinated VOC concentrations appear to be 1,1,1 TCA and PCE. Chlorinated VOC concentrations in the soil gas may be understated due to the presence of elevated BTEX in some samples. (CDM, 2000 RI Appendix D)

Total BTEX concentrations in the central zone of contamination ranged from less than 0.006ppm to 0.180ppm. Toluene and xylene are the primary contributors to the total BTEX concentration in this zone as well. Total chlorinated VOCs in the central zone ranged from less than 0.010ppm to 0.224ppm. Primary contributors to total chlorinated VOC concentrations appear to be 1,1,1 TCA and PCE. As with the western zone, chlorinated VOC concentrations in the soil gas may be understated due to the presence of elevated BTEX in some samples. (CDM, 2000 RI Appendix D)

One notable concentration of total chlorinated VOCs in soil gas was located on the north side of the right-of-way at the southeast corner of Rohr Manufacturing. Concentrations of total chlorinated VOCs in the soil gas sample obtained from this area reached approximately 1.049ppm. (CDM, 2000 RI Appendix D)

No indoor air analysis was performed in Area 11 because of the industrial nature of the area and the distance to homes.

Surface Soils

Seven surface soil samples were obtained from Area 11 in locations where elevated VOC concentrations in soil gas were identified. The results are included in Table 6. Surface soil samples identified PNAs, pesticides, PCBs, and metals in Area 11. Volatile Organic Compounds were not detected in surface soils samples. Concentrations of PNAs identified ranged from 0.042ppm to 440ppm. Several PNAs (phenanthrene, fluoranthene, benzo(a)anthracene, chrysene, bis(2ethyl-hexyl)phthalate, benzo(b)fluoranthene, and benzo(k)fluoranthene) were detected in all seven samples. Several pesticides were identified ranging in concentrations from 0.003ppm to 0.180ppm. The pesticides detected most often were Dieldrin, Methoxychlor, and alpha-chlordane. Concentrations of PCBs ranging from 0.031ppm to 0.530ppm were detected. Metals were identified at concentrations similar to background in most cases. (CDM, 2000 RI Table 3-11)

Subsurface Soils

Seventeen soil borings were conducted at Area 11. Subsurface sampling results are summarized in Table 6. Volatile Organic Compounds, PNAs, pesticides, and metals were identified in sub-surface soils in this area. Concentrations of VOCs ranged from 0.004ppm to 2,300ppm. The VOCs detected most often were xylene, toluene, ethylbenzene, and acetone. Sub-surface soils collected from SB11-203 in the western portion of Area 11 and north of the Rohr Manufacturing building at depths from 39-41 feet bgs tested positive for NAPL. Soils from SB11-203 contained toluene (180ppm), ethylbenzene (20ppm), xylenes (110ppm), and acetone (5.1ppm). In order to quantify these concentrations of VOCs in the laboratory, the detection limit for chlorinated VOCs (1,1,1 TCA and PCE) was raised to 13ppm. Therefore, chlorinated compounds may be present at concentrations less than 13ppm. Soil samples were also taken from SB11-202 from 39-41 feet bgs and tested positive for NAPL. SB11-202 was also located in the western portion of Area 11 but was south of the Rohr Manufacturing building. Concentrations of VOCs within this sample were similar to that of SB-203. Detection limits for chlorinated VOCs were also raised in this sample, to 27ppm for 1,1,1 TCA and PCE. The thickness of non-chlorinated VOC contamination in the western zone extends from 12 to 24 feet bgs in an area measuring about 17,000ft^2 (CDM OU3 RI 3-45, 3-51 to 3-53)

Sub-surface samples were also taken from the central portion of Area 11 (the central zone of contamination) near the above-ground storage tanks northeast of the former

Rockford Varnish facility. Elevated concentrations of VOCs were also identified within this area as well with 290ppm of toluene and 17ppm of xylene at 35 feet bgs and appear to be limited to depths below 35 feet. The VOC contamination in this central

AREA 11 Contaminant Concentration Ranges and Preliminary Remediation Objectives

Contaminant[1]	TABLE 6 SOIL (ppm)			GROUNDWATER (ppb)	
	Concentration Range in Soil		Remediation Goal	Concentration	MCL
	Above 10 feet	Below 10 feet			
Volatile Organics					
Benzene	BDL	BDL-**1.5**	0.189 [2]	BDL-**23**	5
Ethylbenzene	BDL	BDL-**590**	7.983 [2]	BDL-**3,900**	700
Methylene Chloride	BDL	BDL-2.9	2303 [3]	BDL	5
Toluene	BDL	BDL-**1,400**	638 [3]	BDL-**310,000**	1,000
Trichloroethene	BDL	BDL-**0.41**	0.051 [2]	BDL-**170**	5
Xylenes (total)	BDL	BDL-**2,300**	312 [3]	BDL-**16,000**	10,000
Semivolatile Organics					
Carbazole [4, 5]	BDL- **67**	BDL	32 [6]	BDL	NA
Benzo(a)anthracene [4, 5]	0.069-**200**	BDL	.9 [6]	BDL	NA
Chrysene [4, 5]	0.052-**240**	BDL	88 [6]	BDL	NA
Benzo (b) Fluoranthene [4, 5]	0.086-**220**	BDL	.9 [6]	BDL	NA
Benzo (k) Fluoranthene [4, 5]	0.046-**130**	BDL	.9 [6]	BDL	NA
Benzo(a)pyrene [4, 5]	0.096-**150**	BDL	.3 [7]	BDL	NA
Indeno(1,2,3-cd)pyrene [4, 5]	0.063-**120**	BDL	.9 [6]	BDL	NA
2-Methylphenol	BDL-0.031	BDL-0.580	16,827 [3]	BDL	NA
Metals					
Beryllium	0.035-0.070	NA	1.51 [7]	**153**	4
Pesticides					
Dieldrin [8]	BDL-0.010	BDL-0.002	0.004 [9]	BDL	NA

NOTES:
ppm - Parts per million or milligrams per kilogram
ppb - Parts per billion or micrograms per liter
MCL- Maximum Contaminant Level developed pursuant to Safe Drinking Water Act
J - Value is estimated based on laboratory results
BDL- Below detection limit of laboratory instruments or methods
NA- Compound was not analyzed or measured in laboratory

1) Only compounds that exceed Tier 1 screening level in soil or an MCL in groundwater are included in Table. Compounds in **bold** text are contaminants of concern for soil, and associated remediation objectives shall be attained through remediation. Remediation goals shown for all

other compounds are only for informational purposes.

3) Remediation goal Calculated using equation R15 of TACO which takes attenuation into account.

4) **TABLE 6 notes (continued)** Soil Saturation Limit used. TACO stipulates that remediation objectives can not exceed the soil saturation limit. Therefore, when equation R15 of TACO generated a remediation goal greater than the saturation limit, the saturation limit is used instead.

4) Only Tier 1 residential screening levels for soil for direct contact are considered for semivolatiles because semivolatiles are not currently groundwater contaminants and are not expected to become groundwater contaminants.

5) Compound will be evaluated further through sampling during remedial design. Although compound exceeds Tier 1 residential screening level for soil for direct contact, it is not considered a chemical of concern at this time because semivolatiles' are prevalent in environment and not found in groundwater.

6) Remediation goal is the Tier 1 residential screening level for soil for direct contact.

7) Site specific background value. For beryllium, the value is the Upper Tolerance Limit on background data.

8) Dieldrin not included as a chemical of concern because it was not found in the groundwater. Surface concentration is below Tier 1 residential screening level for soil for direct contact.

9) Remediation goal is the Tier 1 residential screening level for soil for protection of groundwater.

zone of contamination is limited to the area around and west of the aboveground tanks. Although PCE was detected in subsurface soils in this zone at concentrations of .046ppm at 20 feet bgs, it is not suspected that the above ground tanks are a source. Levels of chlorinated VOCs in this area are likely due to lateral migration of gases and volatilization from groundwater. The extent of non-chlorinated VOC contamination in this zone extends from 35 feet bgs to an undetermined depth. The area of VOC contamination in this zone measures approximately 6,000ft^2. (CDM, 2000 RI 3-50, 3-51)

Subsurface concentrations of pesticides, and PNAs were all significantly lower than levels found in surface samples and were also detected less frequently. Concentrations of PNAs identified in subsurface soils ranged from 0.045ppm to 1.9ppm. Concentrations of pesticides ranged in concentrations from 0.001ppm to 0.009ppm. (CDM, *Risk* Table 10)

Groundwater

Groundwater analysis performed on samples taken from wells IW10, IW11, and MW128 indicate the presence of VOCs and metals in groundwater down gradient of Area 11. Area 11 is a significant source of non-chlorinated VOC groundwater contamination. Area 11 has the highest and most extensive concentrations of BTEX compounds found in the groundwater. Concentrations of 2ppm (estimated) ethylbenzene, 310ppm toluene, and 9.5ppm xylene were identified in groundwater in the area. Although Area 11 does contribute chlorinated VOC contamination to the groundwater, it appears to be limited in extent and concentration. Concentrations of TCE (0.170ppm) were higher down gradient of Area 11 than those found up gradient. The chlorinated VOC 1,1,1-TCA was also found in Area 11 groundwater at concentrations up to 0.860ppm but could be the result of the Area 4 plume. Table 6 on page 35 summarizes contaminant concentrations found in groundwater down gradient of Area 11. (CDM, 1995 RI 4-

105,106, 118 and Appendix H)

Non-aqueous Phase Liquid

As mentioned previously, investigations conducted at Area 11, identified two distinct zones of subsurface contamination, one zone, the western zone in the western margin of Area 11 is centralized beneath Rohr Manufacturing. The second zone, the central zone, is located near the above ground storage tanks to the northeast of the former Rockford Varnish building. Non-aqueous phase liquid was detected in the western zone during field screening of SB11-203 soil samples from 39 - 43 feet bgs. A combination of black staining of soils and Sudan IV dye testing confirmed the presence of NAPL in samples taken from 39 - 43 feet bgs. Similar conditions were identified in SB11-202 from 39 - 45 feet bgs. The NAPL in both soil borings was determined to be LNAPL because of its presence within the upper part of the saturated zone. Headspace analysis conducted on samples taken beneath 45 feet bgs in each boring decreased significantly with depth, indicating that DNAPL is not likely to be present in this zone. (CDM, 2000 RI 3-45, 51, 52, and Appendix D)

Sub-surface soil samples taken in the central zone of contamination near the aboveground storage tanks indicate that VOC contamination in this zone begins at approximately 35 feet bgs. Past investigations in this zone indicate the possibility for NAPL but it was not positively identified. Headspace analysis on samples obtained from soil borings SB11-4 and SB11-8, which were advanced during phase II of the OU2 investigation, indicate the greatest degree of VOC contamination at depths of approximately 35 - 42 feet bgs. Soil samples SB11-4G and SB11-8G taken from these depths indicate the possibility for NAPL. However, no staining is noted in the soil boring logs and the Sudan IV dye test was not performed during the OU2 investigation. Regarding the possibility for DNAPL, while minor DNAPL components do exist within soil samples, headspace analysis below 42 feet decrease significantly indicating that DNAPL is probably not present within this zone. (CDM, 1995 OU2 RI 4-66, 4-70,Table 4-4, Appendix A)

The total depth of VOC contamination near the storage tanks cannot be positively determined based on laboratory analysis of soil. However, soil analysis from samples taken near this zone coupled with headspace analysis indicates that it is likely about 10 feet thick, extending from approximately 35 - 45 feet. (CDM, 2000 RI 3-53)

PRINCIPAL THREATS

The *National Contingency Plan* ("NCP") establishes an expectation that U.S. EPA will use treatment to address *principal threats* posed by a site wherever practicable (NCP §300.430(a)(1)(iii)(A)). The term "principal threat" refers to source materials that are considered to be highly toxic or highly mobile that generally cannot be reliably contained or would present a significant *risk to human health* or the environment should exposure occur (USEPA, *Guide* 6-40). Remedial investigations conducted at the site

have identified principal threat wastes at all four source areas (Area 4, Area 7, Area 9/10, and Area 11). Residual NAPL was positively identified at Areas 4, 7, and 11 (CDM, 2000 RI). At Area 9/10 groundwater concentrations were identified that were indicative of a significant source of groundwater contamination and NAPL presence (CDM, 2000 RI 3-77). The following text summarizes information identifying the principal threats at each Source Area.

Area 4

Soil boring SB4-202 taken in the northern part of Swebco's parking lot tested positive for the presence of a LNAPL directly above and within the top portion of the saturated zone (CDM, 2000 RI 3-14). Laboratory analysis of soil within boring SB4-202 contained 510 ppm of 1,1,1-TCA (CDM, 2000 RI 3-14). LNAPL was found present at the source from 27- 35 feet bgs but was not found in deeper portions of SB4-202 (CDM, 2000 RI 3-14). The aerial extent of NAPL contamination was not identified. The estimated volume of contaminated soil at Area 4 is 155,400ft^3 (CDM OU3 FS Appendix C).

Area 7

Subsurface sampling results obtained at Area 7 suggest the presence of NAPL in two hot spots, located at the northern and southern portions of the area. In the southern hot spot, PCE concentrations of 260ppm soil sample SB7-8D suggest the presence of a NAPL (CDM, 1995 RI 4-48). Concentrations of VOCs such as xylene, naphthalene, and 2-methyl naphthalene were also identified within soil boring SB7-8 at concentrations high enough to exist as NAPL (CDM, 1995 RI 4-48). Additionally, the SB7-8D soil boring log indicates an elevated headspace and a strong solvent odor for sample SB7-8D (CDM, 1995 RI Appendix A). Specific tests designed to positively identify NAPL were not performed on soils in the southern hot spot.

Analysis performed on soil samples obtained in the northern hot spot within Area 7 positively identified NAPL. A total VOC concentration of 875ppm was identified in the soil sample taken from SB7-201 at 25 feet bgs. NAPL in soils from 25 to 27 feet bgs from SB7-201 was identified visually and by a shaker dye test. (CDM, 1995 RI 4-48) The aerial extent of NAPL contamination was not identified. The total volume of contaminated soils at Area 7 is estimated to be 1,539,000ft^3 (CDM, 2000 FS Appendix C).

Area 9/10

The concentration of 12ppm of 1,1,1-TCA in MW201 indicates that NAPL is likely present in Area 9/10 based on the aqueous solubility limit of 1,1,1-TCA. Field studies have shown that groundwater concentrations greater than 1% of a contaminant's solubility are strongly indicative of the presence of NAPL (National Research Council). The concentration of 1,1,1-TCA at in MW201 represents 0.8 to 4 percent of its aqueous solubility limit. Dye testing did not reveal the presence of NAPL in the more shallow portions of the unconsolidated aquifer. However, DNAPL would not be expected to be present in the more shallow portions of the aquifer because no confining units are present in the top 100 feet of the aquifer. (CDM, 2000 RI 3-77)

Area 11

Subsurface sampling results obtained at Area 11 suggest the presence of NAPL in two hot spots, located at the western and central portions of the area. Non-aqueous phase liquid was detected in the western zone during field screening of SB11-203 soil samples from 39 - 43 feet bgs. A combination of black staining of soils and Sudan IV dye testing confirmed the presence of NAPL in samples taken from 39 - 43 feet bgs. Similar conditions were identified in SB11-202 from 39 - 45 feet bgs. (CDM, 2000 RI 3-45, 51)

Soil samples taken in the central zone of contamination, SB11-4G (total VOCs 307ppm) and SB11-8G (total VOCs 42ppm) indicate the possibility for NAPL (CDM, 1995 RI 4-70,Table 4-4) . However, no staining is noted in the soil boring logs and the Sudan IV dye test was not performed during the Operable Unit 2 investigation. The aerial extent of NAPL contamination was not identified. The total estimated

volume of soil at Area 11 is approximately 237,084 ft^3 (CDM, 2000 FS Appendix E).

SCOPE AND ROLE OF OPERABLE UNIT

This is the final of three operable units for the Southeast Rockford Groundwater Contamination site. The following text identifies past response actions and how each action relates to the overall site strategy.

Removal Actions In 1989, due to the widespread groundwater contamination in the area, USEPA initiated a time critical removal action that provided residents with bottled water as a temporary measure. In December 1989 residents received point-of-use carbon filters in as another intermediate measure. The USEPA ultimately extended water mains and provided service connections to city water for 283 residences as a time critical removal action. This action was completed in late 1991. (Illinois EPA, *OU2 ROD*)

Operable Unit One The first operable unit provided additional residents with a safe source of drinking water by connecting residences to the municipal water supply system and treating one of Rockford's municipal wells with GAC.

Operable Unit Two The second operable unit, addressed the area-wide groundwater contamination, and provided residents and businesses predicted to have groundwater contamination in the future, with municipal water. The second operable unit also called for future source control measures at the four primary source areas, Area 4, Area 7, Area 9/10 and Area 11. Although source control was a component of the selected remedy within the OU2 ROD, the ROD stated that the actual technology to be used for source control measures would be addressed within Operable Unit Three.

Operable Unit Three Operable Unit Three is the subject of this Proposed Plan. This is the final planned action to address contamination in the Southeast Rockford area that will be conducted under Superfund. This third operable unit will addresses source materials (contaminated soils, NAPL, and leachate) at Areas 4, 7, 11, and 9/10. The source materials at Areas 4, 7, 11, and 9/10 constitute a principal threat and are the primary causes of groundwater contamination at the Southeast Rockford Groundwater Contamination site.

SUMMARY OF SITE RISKS

Risks to human health and the environment caused by Source Areas 4, 7, 11, and 9/10 were evaluated through a process called "*risk assessment*". A risk assessment is a process that characterizes current and future threats to human health and the environment posed by contaminants at the site. The risks to human health and the risks to the environment are usually evaluated separately for each site. A human health risk assessment was conducted for all four source areas and is discussed below in the section entitled "Human Health Risks".

Because of the industrial nature of Source Areas 4, 11, and 9/10, the Illinois EPA and

USEPA determined it was only necessary to evaluate risks to the environment (often called "ecological risks") for Area 7. The results of the ecological risk assessment for Area 7 is discussed below in the section entitled "Ecological Risks".
The calculation of risks to human health and the environment posed by surface water and sediments in the creek running north of Area 7 was problematic. Concentrations of several contaminants (i.e. PNAs and VOCs) in the surface water and sediment at Area 7 and their locations in relationship to the Area suggest another source may be present upstream. Results from a focused sampling event conducted in December of 1998 provided more information regarding the presence of contaminants in the creek, but was unable to establish the contribution of upstream sources in relationship to Area 7.

The Agencies determined that it would be more efficient to further evaluate the creek running north of Area 7 during the design phase of the project. The design phase will likely occur in 2001. If the evaluation of risks to human health and the environment conducted during design identifies the need for remediation in addition to that outlined within this proposed plan and upcoming ROD, the remedy would be appropriately altered. Depending on the significance of the change in remedy, the Agencies may be required to hold additional public meetings and allow public comment on the new remedy.

HUMAN HEALTH RISKS

Human health risks posed by the Source Areas 4, 7, 11, and 9/10 were evaluated and described within the "Southeast Rockford Source Control Operable Unit Risk Assessment Report" dated April 2000. The risk assessment utilized Illinois EPA's *Tiered Approach to Corrective Action Objectives* ("TACO") at 35 Ill. Adm. Code Part 742, to evaluate risks. TACO is a set of State of Illinois regulations that specify methods for developing remediation objectives and identifying chemicals of concern. The human health risk assessment conducted at this site used TACO Tier 1 screening values as well as Tier 3 site specific remediation objectives to evaluate human health risks at each source area.

The risk assessment evaluated three *exposure pathways* at each source area. An exposure pathway is a means by which a person may come in contact with site contaminants. The three exposure pathways evaluated in the risk assessment are: 1) Direct contact with soil (including ingestion of soils and inhalation of vapors from soils); 2) Chemicals transferring (leaching) from soils into groundwater; and 3) Ingestion of vegetables grown at Area 7. The third exposure pathway, ingestion of vegetables, was included because portions of Area 7 are used for agricultural purposes.

The major *contaminants of concern* ("COCs") for soil in each source area, as identified by the RI and the Risk Assessment are listed in Table 7. Contaminants of concern are compounds that are present at the site in sufficient quantities to present an unacceptable risk to human health or the environment. Contaminants of concern were

identified by comparing concentrations identified within the soil or leachate at each area to *preliminary remediation goals*. The preliminary remediation goals ("PRGs") for this site were generated in accordance with 40 CFR 300.430 (e)(2) of the National Contingency Plan and TACO.

The risk assessment identified conditions at all four source areas that constitute a potential or actual threat to human health or the environment. Contaminants present in soil at Areas 4, 7, and 11 exceed concentrations protective of human health for groundwater consumption. The risk assessment also identified soils at Area 7 that exceed direct contact PRGs for direct contact for TCE, and PCE. In cases where the site concentration exceeds levels protective of human health and the environment, risks to human health are considered unacceptable, and remedial alternatives have been developed to address the issue.

Table 7
Contaminants of Concern in Soil

Area 4	Area 7	Area 11	Area 9/10
1,1,1-Trichloroethane	1,1-Dichloroethene	Benzene	None identified
	1,2-Dichloroethene (total)	Ethyl benzene	
	Tetrachloroethene	Toluene	
	1,1,1-Trichloroethane	Xylenes (total)	
	Trichloroethene		
	Xylenes (total)		

As indicated within Table 7, no COCs were identified for Area 9/10. The investigation at Area 9/10 was impeded due to limited access and concern over underground utilities in the area. Although no soil samples were obtained that identified soil concentrations above PRGs, remediation is still considered for this area. Groundwater concentrations beneath Area 9/10 were among the highest identified within the Southeast Rockford study area. The concentration of 12ppm of 1,1,1-TCA in MW201 indicates that NAPL is likely present in Area 9/10 based on the aqueous solubility limit of 1,1,1-TCA. The likelihood that NAPL is present at Area 9/10 constitutes a principal threat. In accordance with the NCP at §300.430(a)(1)(iii)(A), this proposed plan formulates treatment alternatives that will address the principal threats posed at each source area.

Polynuclear Aromatic Hydrocarbons were identified as COCs in Areas 4, 11, and 9/10. However, they are not included in Table 7 as COCs and were not purposefully addressed by the alternatives discussed within this proposed plan. Additional data are required to determine if PNAs are truly COCs or simply contamination from activities other than the mis-management of hazardous materials. For instance, the presence of PNAs in areas with parking lots could be attributed to the asphalt which contains PNAs. Additionally, PNAs would be expected in industrial areas where vehicles may leak motor oil, or scrap wood or other materials are burned. In summary, because PNAs were only detected in a few groundwater samples, and their presence in soils may be

from normal industrial activities, PNAs are not addressed within this proposed plan. Additional samples will be obtained in Areas 4, 11, and 9/10 during the *remedial design* phase. The remedial design will be conducted in 2001. If the evaluation conducted during design identifies the need for remediation in addition to that outlined within this proposed plan and upcoming ROD, the remedy would be appropriately altered. Depending on the significance of the change in remedy, the Agencies may be required to hold additional public meetings and allow public comment on the new remedy.
In order to be protective, Illinois EPA chose to assume that all of the source areas were, or could become residential areas. Area 7 is currently zoned residential. Areas 4, 9/10, and 11 are all zoned industrial and city plans are consistent with current use. However, because residential areas were nearby Areas 4, 9/10, and 11, and because access to these areas was not entirely limited, residential exposures could occur.

The following are the potentially exposed populations at each source area and the estimated associated risks as identified within the Risk Assessment:

Source Area	**Exposed Population** [1]	
	Resident -Direct Contact	Resident- Protection Of Drinking Water
Area 4	Less than $1x10^{-6}$ and *Hazard Index* of 1[2]	**Greater** than $1x10^{-6}$ or Hazard Index of 1
Area 7	**Greater** than $1x10^{-6}$ or Hazard Index of 1	**Greater** than $1x10^{-6}$ or Hazard Index of 1
Area 9/10[3]	Less than $1x10^{-6}$ and Hazard Index of 1	Less than $1x10^{-6}$ and Hazard Index of 1
Area 11	Less than $1x10^{-6}$ and Hazard Index of 1	**Greater** than $1x10^{-6}$ or Hazard Index of 1

Notes:

1. The site worker scenario was not evaluated separately from the residential scenario. If concentrations of COCs are protective for residents, it is assumed that concentrations are also protective for site workers since time spent at site would be less.
2. Human health risks are usually evaluated as carcinogenic (those compounds that can cause cancer), and non-carcinogenic (those compounds that can cause harm, but not cancer). For carcinogenic risks, risks are usually quantified as a unitless probability of a person getting cancer. U.S. EPA's generally acceptable risk range for site-related exposures is 10^{-4} to 10^{-6}. The potential for non-carcinogenic effects is evaluated by the ratio of exposure to toxicity, called the Hazard Quotient. Adding all of the Hazard Quotients together generates the Hazard Index. A Hazard Index less than 1 is considered acceptable in that toxic effects are unlikely.
3. The investigation at Area 9/10 was impeded due to limited access and concern over underground utilities in the area.

As mentioned previously, Illinois EPA was unable to quantitatively evaluate human health risks to residents who were exposed to creek surface water and sediments in Area 7. Data obtained from the creek were inconclusive as the Agencies were unable to identify off-site impacts to the creek. Due to the intermittent nature of the creek and its shallow depths, risks to individuals wading in the creek are expected to be low. However, additional data will be obtained from the creek and risks to human health will

be quantitatively evaluated during the design phase.

ECOLOGICAL RISKS

Area 7

A screening-level ecological risks assessment (ERA) was conducted for Area 7. The ERA focused on the creek running north of Area 7. The ERA's primary purpose was to identify contaminants in the surface water and sediment of the creek that could result in adverse effects to present or future ecological *receptors*. Receptors are plants or animals that could be impacted by contamination. The overall approach for the ERA at this site to: 1) Identify chemicals of potential concern (COPC); 2) Identify potential receptors; 3) Identify Exposure Scenarios; and 4) Compare measured concentrations in surface water and sediments to concentrations in laboratory tests ("*ecological screening benchmarks*" or "screening ecotoxicity values") that did not result in significant effects to relevant and sensitive test species. (CDM, *Ecological*).

The results of the ERA determined that at the screening level, risks to organisms living in or nearby the creek (benthic, aquatic, and semi-aquatic) were either low or not present at all. **However,** as mentioned previously, concentrations of several contaminants (i.e. PNAs and VOCs) and their locations in relationship to the site concerned the Agencies. The results did not provide any clear trends because at some times concentrations were higher upstream than downstream. This suggests another source may be present upstream.

On December 16, 1998, after the ecological risk assessment had been conducted, Illinois EPA obtained additional samples of the surface water and sediments within the creek. The objective of the sampling event was to provide more information regarding the type and source of the contaminants in the creek. Results from the December 1998 sampling event identified several compounds that were not detected during the 1996 investigation as well as higher concentrations of several compounds that had been detected previously. Tables 3 (sediment) and 4 (surface water) compare measured concentrations in the field in 1996 and 1998 to screening ecotoxicity values to identify compounds that could potentially result in adverse affects to organisms present in Area 7.

Upon evaluation of both the 1996 and 1998 data in conjunction with screening ecotoxicity values, the Agencies determined that a more in-depth analysis of ecological risk in Area 7 was necessary. However, because there may be an additional upstream source and the data from the creek is inconclusive, the Agencies determined that it would be more efficient to evaluate Area 7 further during the design phase of the project. The design phase will likely occur in 2001. If the ecological risk evaluation conducted during design identifies the need for remediation in addition to that outlined

within this proposed plan and upcoming ROD, the remedy would be appropriately altered. Depending on the significance of the change in remedy, the Agencies may be required to hold additional public meetings and allow public comment on the new remedy.

Rock River

The ecological risk assessment conducted for this Operable Unit did not specifically address impacts that the four Source Areas would have on the Rock River. This assessment was conducted under the RI/FS for OU2. Modeling was conducted on the impacts of groundwater contaminant concentrations on the Rock River through a 30-year and a 50-year scenario. Both scenarios showed concentrations of chlorinated VOCs entering the river. However, the modeling indicated that even if the four source areas were not remediated, concentrations would not exceed surface water criteria and in fact, are expected to be two orders of magnitude below the criteria. The 50-year scenario did show that source area remediation to MCLs occurring within a 10 to 20 year time span would result in measurable reductions in contaminant mass entering the river. (CDM, 1995 FS Appendix C)

In summary, based on the evaluation of human health and ecological risks, it is the Illinois EPA's current judgment that the Preferred Alternative, or one of the other active remediation measures considered in the Proposed Plan, is necessary to protect public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

REMEDIAL ACTION OBJECTIVES

Remedial Action Objectives (RAOs) provide a general description of what the proposed alternative will accomplish. The following RAOs apply to all four Source Areas:

Prevent the public from ingestion of soil, and direct contact with soil containing contamination in excess of state or federal standards or that poses a threat to human health;

Prevent the public from inhalation of airborne contaminants in excess of state or federal standards or that pose a threat to human health; and

Prevent the **further** migration of contamination from the source area that would result in degradation of site-wide groundwater or surface water to levels in excess of state or federal standards, or that pose a threat to human health or the environment[1].

[1]It should be noted that contaminant migration from the source areas has already resulted in site-wide groundwater contamination in excess of state standards. The RAO is intended to remediate each source area in order to prevent **further** migration of contaminants from the source area.

Area 7, because of its unique characteristics as a park that contains a creek, has these RAOs in addition to the general RAOs listed above:

> Prevent the public from ingestion and direct contact with surface water containing contamination in excess of state or federal standards or that poses a threat to human health; and
>
> Prevent the migration of contamination from Source Area 7 that would result in degradation of surface water and sediment in the unnamed creek to levels in excess of state or federal standards or that pose a threat to human health or the environment.

Basis for Preliminary Remediation Goals

Preliminary Remediation Goals ("PRGs") are identified for each Source Area in Tables 1 (Area 4), Table 2 (Area 7), Table 5 (Area 9/10), and Table 6 (Area 11). The PRGs for each area address concentrations of contaminants of concern within soil and leachate (contaminated groundwater).

Leachate

The OU2 ROD required source control measures to "reduce and control potential groundwater risks to the environment". Based on the ROD's requirement, a RAO was developed with the intent of preventing further migration of contamination from the source area that would increase site-wide groundwater concentrations. As noted previously, site-wide groundwater is already contaminated at levels above state standards, but contaminant levels will begin to decrease due to natural attenuation processes after source area remediation takes place. Source remediation in addition to the creation of a *groundwater management zone* ("GMZ") will achieve PRGs for the leachate. Four separate GMZs (one at each source area) will be established pursuant to Illinois groundwater regulations at 35 Ill. Adm. Code Section 620.450. These regulations allow for the creation of a GMZ as a three dimensional region containing groundwater being managed to mitigate impairment caused by contamination. The GMZ boundary becomes a perimeter around the site, similar to an imaginary fence, where on the outside of the boundary, groundwater must meet state standards. The aerial extent of the four GMZs will encompass the hot spots and locations surrounding the hot spots where remediation has, or at some point in the foreseeable future, will have a measurable effect in reducing contaminant concentrations. The PRGs for leachate are based on federal MCLs and must be met at the GMZ boundary.

Soil

The PRGs for soil are based on concentrations designed to be protective of human health for: direct contact with soil (ingestion of soils and inhalation of vapors from soils); ingestion of vegetables grown in the soil; and groundwater ingestion (so that chemicals leaching from soils into groundwater do not cause concentrations in groundwater to

exceed either MCLs (if they are available), or risk based groundwater concentrations). The soil PRGs protective of direct contact and groundwater ingestion are established in accordance with the TACO regulations. Soil PRGs protective of ingestion of vegetables were calculated in a manner outside the scope of the TACO regulations (i.e. Tier 3 analysis) that was approved by Illinois EPA and U.S. EPA.

Intended Use of Preliminary Remediation Goals

Preliminary Remediation Goals will be finalized within the Record of Decision and are then known as remediation goals. Remediation goals (and PRGs prior to ROD completion) for soil protective of direct contact with soil, ingestion of vegetables grown in soil, and protective of groundwater are used as criteria, or points of reference within the ROD. These criteria, or "points or reference" are utilized to identify technologies applicable to each source area as well as to identify the aerial extent of the hot spots that the technologies must address. Remediation goals for soil protective of direct contact with soil, and ingestion of vegetables grown in soil, shall be met in soils at each source area. However, soil remediation goals for protection of groundwater may be superseded by valid and complete empirical data (i.e. groundwater analysis) which show that ARARs (*Applicable or Relevant and Appropriate Requirements*) are consistently met at the GMZ boundary[1]. For example, if a remediation system at an area of concern has been in operation for a reasonable amount of time and groundwater data show that ARARs are being met at the GMZ within several wells, the operation of the system could be discontinued (even though soil concentrations are above the PRGs for protection of groundwater). In this case, it is probable that assumptions made in the calculation of the soil PRGs for protection of groundwater were incorrect and existing soil concentrations are actually still protective.

SUMMARY OF REMEDIAL ALTERNATIVES

The remedy evaluation process conducted by the agencies compared a number of potential action alternatives as well as a no action alternative for each Source Area. Upon a thorough screening of a wide spectrum of in-situ (in-place) and ex-situ (above ground) remedial alternatives, the alternatives discussed below were selected for detailed analysis and subjected to evaluation under the nine NCP criteria. Remedial alternatives that deal with the site contamination in-situ as well as those that treat contaminants after excavation (ex-situ) were evaluated.

Soil alternatives have been developed for all source areas, Area 4, Area 7, Area 9/10, and Area 11. U.S. EPA has developed a *presumptive remedy* for soils contaminated by VOCs. Presumptive Remedies are preferred technologies for common categories of

[1]The terms "Applicable or Relevant and Appropriate Requirements" and "groundwater management zone" are discussed more fully within the section Description of Alternatives as well as the glossary.

sites based on historical remedy selection and engineering studies (USEPA, *Presumptive*). Upon evaluation of U.S. EPA's directive on presumptive remedies for soils contaminated by VOCs, the Agencies determined that the presumptive remedy approach is appropriate for addressing the types of contaminants found in the source areas at the Southeast Rockford site. The directive produced by U.S. EPA identified three technologies as presumptive remedies for VOCs in soil: *soil vapor extraction* (SVE); *thermal desorption*; and *incineration*. Out of the three technologies, U.S. EPA has identified SVE as the *preferred* presumptive remedy. The source area presumptive remedies considered implementable for this site include SVE and thermal desorption (incineration is usually not a cost effective remedial alternative unless the site requiring remediation is large, with large amounts of waste needing treatment). Soil vapor extraction works by sucking out the contaminated air that exists in the soil pores beneath the surface. As the contaminated soil pore air is removed, more *volatile* compounds move from the soil into the soil pores, thereby cleaning up the soil as well as the soil pores. Thermal treatment involves treating the soil by heating it up to a certain temperature where contaminants would volatilize off the soils. Soil remedies have been assembled into remedial alternatives for each source area and are discussed below. In addition to the presumptive remedies for soil, ex-situ bioremediation has also been considered at Area 7 as an alternative to thermal desorption of excavated material.

Contaminated leachate above PRGs is also present at the GMZ boundary at Area 4, Area 7, and Area 9/10. Areas 4, 7, and 9/10 each have contaminated leachate at the GMZ boundary as well as the likely presence of NAPL. The U.S. EPA's presumptive remedy for VOCs in soil does not address contaminated leachate. Therefore, remedial alternatives were developed and evaluated for leachate that was outside of the domain envisioned by the presumptive remedy guidance for VOCs.

No leachate alternatives were developed for Area 11. Although Area 11 has contaminated leachate and LNAPL at the interior of the area, computer modeling conducted for Area 11 indicated that natural processes would meet RAOs for leachate at the site boundary in this area. However, predicting the movement of LNAPLs in the subsurface is complicated. The computer and mathematical models used for this superfund site can only account for the movement of dissolved contaminants, and cannot account for the movement of LNAPLs. Concerns also exist at Area 11 regarding high concentrations of BTEX contaminants possibly masking the presence of chlorinated VOCs. In order to provide real data regarding the degradation of contaminants near the site boundary, approximately four additional monitoring wells will be installed during the design phase. If analysis indicates that contaminants are not degrading to levels near MCLs or risk based corrective action levels, *air sparging* will be considered in addition to SVE. Air sparging is included as an alternative to deal with leachate contamination at Areas 4, 7, and 9/10. Air sparging has the added benefit of enhancing biodegradation in both groundwater and vadose zone soils and will address the concerns and RAOs for Area 11.

Every alternative that was selected for detailed analysis for the four source areas is described below in the section entitled "Description of Alternatives". The alternatives that are proposed by the Agencies are identified in Table 8.

TABLE 8
Proposed Alternatives

Area	Media	Name	Alternative Description
Area 4	Soil	SCS-4D	Excavation, on-site Low Temperature Thermal Desorption
	Leachate	SCL-4B	Leachate containment with collection and treatment, surface water discharge, monitoring, restriction on groundwater usage
Area 7	Soil	SCS-7E	SVE and air sparging[1] at source
	Leachate	SCL-7B	*Multi-phase extraction* (MPE)[2] , leachate containment with collection and treatment, surface water discharge, monitoring, restriction on groundwater usage
Area 9/10	Soil	SCS-9/10C	SVE
	Leachate	SCL-9/10D	Reactive Barrier Wall[3], monitoring, restriction on groundwater usage
Area 11	Soil	SCS-11C	SVE
	Leachate	SCL-11A	No Action

TABLE NOTES:

1 Air sparging is a process by which air is injected into the contaminated groundwater. The bubbles generated extract volatile contaminants from the groundwater as they rise to the surface.

2 Multi-phase extraction (MPE) is a remedial technology whereby soil vapors and groundwater are extracted at the same time through the same extraction point. MPE is an enhancement of SVE (SVE just extracts soil vapors).

3. A *reactive barrier wall* essentially an underground trench filled with a reactive substance such as iron filings that will react with groundwater as it flows through the wall.

An alternative that consists of no active remediation (i.e. the "No Action Alternative") was developed for each source area. The NCP requires that a "No Action" alternative is included in the detailed analysis to provide a baseline for comparison to the other alternatives. It should be noted that for the leachate alternatives, a *true* "No Action Alternative" could not be developed because groundwater monitoring was required within the 1995 OU2 ROD. Therefore, for leachate, the No Action Alternative must include one action, that of groundwater (or leachate) monitoring.

COMMON ELEMENTS

Under each alternative, the assumption is made that the City of Rockford's ordinance prohibiting the installation of private wells will be enforced. Also, each alternative requires that a GMZ per 35 Ill. Adm. Code Part 620 be established. Illinois groundwater regulations at 35 Ill. Adm. Code Section 620.450 allow for the creation of a GMZ as a three-dimensional region containing groundwater being managed to mitigate impairment caused by contamination. The GMZ boundary becomes a perimeter around the site, similar to an imaginary fence, where on the outside of the boundary, groundwater must meet state standards. The GMZ will remain in effect providing that

controls such as remediation, management, and monitoring continue at the source area. During the time when the GMZ is in effect, State groundwater standards will not be applicable within the aerial extent of the GMZ. In addition to source area monitoring, groundwater monitoring will continue throughout the site-wide groundwater as required by the OU2 ROD. Because groundwater monitoring was required within the OU2 ROD, leachate alternatives entitled "No Action" do include monitoring and will incur some costs.

INSTITUTIONAL CONTROLS

In order to be protective of human health and the environment, several alternatives described within this proposed plan require use or access restrictions on contaminated properties within the boundaries of the source area. Use restrictions or access restrictions would be implemented through the use of institutional controls. Institutional controls are administrative or legal constraints that minimize the potential for exposure to contamination by limiting land or resource use. Specific actions taken at sites to restrict access or use could include: Governmental Controls- such as zoning restrictions or ordinances; Proprietary Controls- such as easements or covenants; Enforcement Tools- such as consent decrees or administrative orders; and Informational Devices- such as deed notices or state registries. Employing several types of access or use restrictions simultaneously can increase the effectiveness of institutional controls. The Illinois EPA and U.S. EPA plan to pursue multiple types of institutional controls at each source area. The approved FS dated September 5, 2000 discusses institutional controls generally, but often refers to them as "deed restrictions". This proposed plan will refer to institutional controls either by name, or as "access restrictions", or "use restrictions".

MODELING

In order to help assess each alternative's impact and effectiveness in remediating the soil and leachate contamination at each source area, the computer model BIOSCREEN (U.S. EPA 1996) was used. BIOSCREEN is a computer program that takes into consideration the amount and type of contaminants at a source area, and simulates the spread, and degradation of those contaminants over time and distance. The program can also consider the impact an alternative would have on the spread and degradation of contaminants at a source area. BIOSCREEN was applied to each alternative to calculate the approximate time (in years) that it would take for the contaminants present at each source area to meet remedial goals at the GMZ boundary[1]. It is important to note that BIOSCREEN is just a screening model and has certain assumptions built into the program. BIOSCREEN was used at this site to provide a general criterion with which to compare the different alternatives. The results of BIOSCREEN or any model

[1]Contaminant spread and dilution at Source Area 9/10 was unable to be modeled accurately due to the lack of information on contaminants in the area.

cannot be used to predict the ***exact*** time it will take for a source area to meet remediation goals. BIOSCREEN could not be utilized for Area 9/10 because of limited data available for this area. At Areas 4, 7, and 11 each alternative was evaluated individually by BIOSCREEN, assuming that no other alternatives will be selected for that source area. At Areas 4, 7, and 9/10, two remedial alternatives are being proposed, one to address soil contamination, and one to address leachate contamination. Because BIOSCREEN only accounted for a single alternative at each area, and two alternatives are actually being proposed for each area (one for soil and one for leachate), the estimated time frame to achieve remediation action objectives is likely overestimated.

ALTERNATIVES INVOLVING THERMAL TREATMENT

Several soil treatment alternatives evaluated for Areas 4, 7, and 11 involve thermal treatment technologies. Thermal treatment technologies address contamination with heat. A common concern regarding some thermal treatment technologies is the formation of products of incomplete combustion such as *dioxins* or *furans*. Under certain conditions, the addition of heat to chlorinated organic compounds in the presence of oxygen can produce dioxins and furans. Chlorinated VOCs are present in the soils at Areas 4 and 7. If an alternative is selected that involves thermal treatment, each unit will be pre-tested on-site prior to full-scale operation. The pre-test is often called a "*proof-of-performance*" test. During the proof-of-performance test, air emissions from the stack will be sampled for: volatile organic compounds (VOCs), dioxins, and pH. Several other parameters will also be measured during the proof-of-performance testing to ensure that conditions are adequate for destruction of VOCs. These parameters are measured at specific locations within the treatment system and are specific to each type of technology. During the proof-of-performance test, measurements of these parameters are noted and compared with emission rates of various compounds. These measurements are then used as a guide to show that conditions within the treatment system are optimal for efficient system operation and VOC destruction. Following the proof-of-performance test, results from the air sampling for dioxins and furans will be evaluated in a risk assessment to ensure that the treatment systems operate in a manner protective of human health and the environment. If the results of the proof-of-performance tests show that the thermal treatment units are operating properly, full-scale operation will begin. During the proof-of-performance test as well as full-scale operation, continuous monitoring (temperature, pH, and Volatile Organic Material) will be conducted on each thermal treatment unit. Continuous monitoring will ensure that the unit is running properly and within the correct temperature range to ensure efficient contaminant destruction. In addition, specific air monitoring will occur at scheduled intervals to ensure that, if dioxins and furans are produced, the levels emitted will be protective of human health and the environment.

If a thermal treatment technology is chosen for Area 11, a proof-of-performance test and continuous monitoring will also be implemented at that area. However, because

contaminants are almost entirely non-chlorinated, dioxin/furan testing will be much less intensive.

Thermal treatment at all three source areas would also involve a surface water discharge (on-site at Areas 4 and 7, off-site at Area 11). Water may be utilized in the scrubber unit in combination with a neutralizing material such as calcium sulfate. The water and calcium sulfate serve to remove hydrochloric acid and chlorine gases formed in the thermal treatment unit and will prevent these gases from being vented into the atmosphere. Scrubber water would then be treated for pH and discharged to surface water. Water discharged to the environment would be monitored periodically to ensure it meets the substantive requirements of the *National Pollutant Discharge Elimination System* (NPDES) regulations.

DESCRIPTION OF THERMAL TREATMENT UNITS

Two types of thermal treatment technologies are included as alternatives within this proposed plan: *catalytic oxidation*, and Low Temperature Thermal Desorption (LTTD). Catalytic Oxidation is a thermal treatment process that destroys contaminants at low temperatures (compared to most thermal processes) through the use of a catalyst. Low Temperature Thermal Desorption is a thermal treatment process that heats up contaminated media in order to volatilize off the contaminants rather than destroy them. Potential ARARs for both thermal treatment technologies include:

35 Ill Adm Code Section 215.301 Section 215.301 states that "no person shall cause or allow the discharge of more than 3.6 kg/hr (8 lbs/hr) of organic material into the atmosphere from any emission unit..." and is applicable to both thermal units;

Clean Air Act Section 112(b) Section 112(b) requires that in order to be considered a "minor" source, the emissions of *Hazardous Air Pollutants* (HAPs)[1] as listed in Section 112(b) of the Clean Air Act (CAA) shall not be equal to or exceeding 10 tons per year of a single HAP or 25 tons per year of any combination of such HAPs; and

40 CFR 63.1203 In addition, relevant portions of the standards at 40 CFR 63.1203, which are applicable to hazardous waste incinerators, will be applied to the thermal units identified within this Proposed Plan. Although the thermal treatment units are not considered by Illinois EPA to be incinerators and the waste being processed is not expected to be hazardous, the regulations are considered relevant and appropriate.

Both thermal treatment technologies, catalytic oxidation and LTTD, are discussed in more detail below.

Catalytic Oxidation

The catalytic oxidation unit would treat vapors containing compounds extracted from

[1] Hazardous Air Pollutants as identified within Section 112(b) of the Clean Air Act.

contaminated soil or water. Within the catalytic oxidation unit, oxidation of the organic compound occurs whereby oxygen reacts with the compound containing carbon and hydrogen to form primarily carbon dioxide and water. Oxidation of a chlorinated compound within the catalytic oxidation unit results in the formation of primarily carbon dioxide and hydrochloric acid. The presence of the catalyst, typically a precious metal formulation (e.g., platinum or palladium), facilitates the oxidation reaction. The catalyst increases the rate of reaction without being used up in the reaction. Because the catalyst increases the rate of reaction, the reaction can occur at lower temperatures. As such, catalytic oxidation units operate at much lower temperatures (approximately 890° F - 1000° F[1]) than thermal incineration systems which operate at approximately 1000° F - 1400° F. Primary components of the treatment system that includes the catalytic oxidation unit consist of: liquid/vapor separator, heat exchanger, burner (to indirectly pre-heat vapor to 890° F), catalytic oxidation unit, and scrubber. Liquid collected in the liquid/vapor separator will be taken off-site for disposal at a permitted facility. Water used in the scrubber unit to treat vapor for pH, will itself be treated for pH and discharged to near-by surface water. Discharged water would be monitored periodically to ensure it meets the substantive requirements of the NPDES regulations.

Low Temperature Thermal Desorption

Low Temperature Thermal Desorption would treat soils after excavation. The LTTD unit would be direct-fired and would operate at temperatures up to 1,000° F which is sufficient to convert the contaminants in the soil to the vapor phase. The LTTD unit is not intended to provide destruction of organic contaminants, but rather to physically separate the contaminants from the soil. After contaminants are removed from the soil, the vaporized contaminants are then directed through a bag house to remove particulate matter prior to being introduced to the afterburner. The concentrations of contaminants are expected to be high enough that the use of an afterburner will be necessary. The afterburner is a separate unit that operates at temperatures between 1,600° F and 1,800° F, which is sufficient to treat the contaminants to primarily carbon dioxide, water vapor, and hydrochloric acid. As with the catalytic oxidation unit, a scrubber would be used to treat the vapor for pH prior to release to the environment. Scrubber water would then be treated for pH and discharged to near-by surface water. Water discharged to the environment would be monitored periodically to ensure it meets the substantive requirements of the NPDES regulations.

DESCRIPTION OF ALTERNATIVES

Every alternative that was selected for detailed analysis for the four source areas is described within this section. The description for each alternative includes costs divided into three categories: Capital (costs to construct the remedy); Annual Operation and Maintenance (O&M) which are costs necessary to keep remedy operational after construction is complete; and, Total Present Worth, which accounts for the time-value

[1]Global Technologies Proposal for CDM May 11, 2000

of money and includes all costs to be incurred over the life of the remedy. In addition, the description for each alternative includes discussion of key ARARs that differ from those required by other alternatives. Applicable or Relevant and Appropriate Requirements are generally requirements that must be met regarding either a contaminant that is present, an action being conducted, or the location of the source area. The glossary at the end of this document defines the term "ARARs" more fully.

SOURCE AREA 4

Source Area 4 - Soil

SCS-4A: No Action

For Alternative SCS-4A, no active measures would be undertaken to control or remediate the soil. No use or access restrictions would be imposed. Soil contaminants would remain on-site and would not be reduced in volume, treated, or contained. Computer modeling predicted that the time to meet state groundwater standards at the GMZ under this alternative would be approximately 60 - 70 years. There are no costs to implement this alternative.

SCS-4B: Limited Action (restrictions on groundwater and land usage)

Alternative SCS-4B includes placing use restrictions on the contaminated area to prevent installation of drinking water wells and future site development within the soil source area. Soil contaminants would remain on-site and would not be reduced in volume, treated, or contained. The time to reach state groundwater standards at the GMZ under this alternative would be the same as Alternative SCS-4A, approximately 60 - 70 years. Future source area development would be restricted for approximately 60 - 70 years when the RAOs would be met. The estimated costs for this alternative are as follows:

Capital:	$28,000
Annual O&M:	$0
Total Present Worth:	**$28,000**

SCS-4C: Soil Vapor Extraction with vapor treatment by catalytic oxidation

Under this alternative, contaminated soils would be remediated in-situ via a SVE system. Soil Vapor Extraction is the preferred presumptive remedy for soils contaminated with VOCs.

A blower will provide the source of negative pressure to extract vapors from the subsurface through a series of wells connected by an underground piping. Due to the presence of residual NAPL and a possible scenario of air sparging with steam injection as the remedial action for leachate control, it has been assumed that the wells will be constructed of carbon steel. A pilot testing program would be conducted prior to the design and construction of the SVE system to determine well spacing and well construction details. The SVE system will treat all contaminated soils at the site above the water table to remediation goals. Pockets of highly contaminated soils or pockets of

NAPL will increase the remediation time frame. Given the presence of residual NAPL at this source area, it is expected that significant quantities of contaminated vapors will be extracted. Vapors extracted from soil will go into a liquid vapor separator. The liquid will be collected in a tank and sent off-site for proper treatment/disposal. The vapors will be treated with a catalytic oxidation unit. The time to reach state groundwater standards at the GMZ under this alternative would be approximately 20 - 30 years. It would take approximately 20 - 30 years to meet RAOs for this alternative. The estimated costs for this alternative are as follows:

Capital:	$479,000
Annual O&M:	$135,160
Total Present Worth:	**$2,156,000**

SCS-4D: Soil Excavation and On-Site Thermal Treatment with low-temperature thermal desorption followed by afterburner

Alternative SCS-4D is the proposed alternative for soil remediation at Area 4. Low Temperature Thermal Desorption is a presumptive remedy for VOCs in soil although it is not U.S. EPA's *preferred* technology. Under this alternative, approximately 2,800 cubic yards of contaminated soils would be excavated and VOCs would be removed through on-site thermal treatment via a LTTD unit. Soil gas analysis indicates that a portion of contaminated soil may be present beneath the former Swebco building. Excavation of soil beneath the building would require part of the structure to be demolished and re-built following project completion.

The majority of the contaminated soil is located below the water table. Therefore, Alternative SCS-4D would include the installation of well points for dewatering at a flow rate of 15 gpm to lower the water table to expose the residual NAPL. The water collected during the dewatering process will be contained on site in two 21,000 gallon carbon steel tanks, and transported to an appropriate disposal facility at a frequency to be determined during the design phase. The soil would then be excavated and stockpiled for processing. Due to the levels of VOCs expected during excavation, the cost to install a temporary enclosure over the excavation for emissions control has been included. Contaminated vapors will be collected from the temporary enclosure and directed to the afterburner used in conjunction with the LTTD unit.

Excavated soils would be screened to remove particles greater than four inches in size and then conveyed to the primary treatment unit where the contaminants are thermally desorbed from the soil and destroyed in the afterburner. The treated soil is then conveyed to a process unit that cools and re-hydrates the soil. The soil is stockpiled for testing to ensure that the clean-up goals have been achieved. The production rate of this system ranges from 80 to 120 tons per hour depending on soil type and moisture content. Based on this range, it would take approximately one month to thermally process the soil. The excavation would be backfilled upon completion of treatment of soil to acceptable levels. It would take approximately 5 to 15 years to meet RAOs for

this alternative. The estimated costs for this alternative are as follows:

Capital:	$2,121,000
Annual O&M:	$0
Total Present Worth:	**$2,121,000**

Source Area 4 - Leachate

Currently, no groundwater wells (potable or non-potable) exist within the GMZ of Area 4. All Area 4 leachate remedies include institutional controls to restrict groundwater usage within the GMZ as well as installation of monitoring wells and implementation of a groundwater and leachate monitoring program. The groundwater and leachate would be monitored at predetermined intervals for 30 years (per RCRA post-closure groundwater monitoring requirements). Monitoring will typically consist of collecting groundwater and analyzing for VOCs and, where appropriate, parameters which measure biological activity.

SCL-4A: No Action (leachate monitoring, restrictions on groundwater usage)

This alternative would consist of no action with leachate monitoring, and institutional controls on groundwater usage for Area 4. Although leachate concentrations would continue to attenuate naturally, this alternative would not comply with RAOs for 60 to 70 years. The estimated costs for this alternative are as follows:

Capital:	$54,000
Annual O&M:	$7,000
Total Present Worth:	**$269,000**

SCL-4B: Hydraulic Containment (leachate monitoring, leachate containment/collection and treatment and on-site surface discharge, and groundwater use restrictions)

Alternative SCL-4B is the proposed alternative for leachate remediation at Area 4. The Hydraulic Containment alternative would include installation of a leachate containment system, monitoring of the source area leachate and groundwater, and implementation of groundwater use restrictions. As part of the leachate containment system, four leachate extraction wells, piping, controls and an air stripping unit would be installed. The leachate would be extracted from the extraction wells by submersible pumps and directed to an air stripping unit at a rate of approximately 20 gpm. The collected leachate would be treated by the air stripping unit to acceptable levels. The treated effluent would be discharged on-site to a stormwater ditch located approximately 200 feet north of the source. The effluent would be monitored periodically for VOCs to confirm that the leachate is treated to acceptable levels.

The treatment method for vapors stripped from the leachate in the air stripping unit will depend on which soil alternative is implemented. The vapors would be directed to the

catalytic oxidation unit if SCS-4C is the chosen soil alternative. The vapors generated by the air stripping unit as a part of this alternative would be treated by GAC in combination with all other soil alternatives. This alternative would comply with RAOs after approximately 35 to 45 years. The estimated costs for this alternative account for vapor treatment by GAC and are as follows:

Capital:	$249,000
Annual O&M:	$12,000
Total Present Worth:	**$1,117,000**

SCL-4C: Install Injection Wells Along Northwestern Boundary of the GMZ/Install Air Sparging Unit/Inject Air/Restriction On Groundwater Usage

Alternative SCL-4C includes the installation of air injection wells and an air sparging unit. The injection wells would be installed down gradient along the northwestern boundary of the GMZ and screened in the saturated zone. Air would be injected into the subsurface to volatilize the contaminant vapors to the vadose zone where they would be removed by vacuum extraction. The air sparging system would be required to operate in conjunction with an SVE system described in alternative SCS-4C. Vapors produced by air sparging will be collected in the SVE system and directed to the catalytic oxidation unit. Air sparging without SVE would cause migration of the vapors away from the site and may create unacceptable risks to human health and the environment. This alternative would comply with RAOs after approximately 15 to 25 years. The estimated costs for this alternative are as follows:

Capital:	$2,037,000
Annual O&M:	$57,000
Total Present Worth:	**$2,522,000**

SCL-4D: Reactive Barrier Wall/Leachate Monitoring/Groundwater Use Restrictions

Alternative SCL-4D would include the installation of a 300-foot reactive barrier wall to an average depth of 60 feet bgs down gradient of the source area (on the northwestern boundary of the GMZ). The reactive barrier wall would have a thickness of 2 feet, comprised of a permeable reactive iron media and positioned such that it is able to treat the corresponding leachate plume. As the contaminated leachate moves passively through the treatment wall, the contaminants are removed by sorption onto the iron media. During reactive wall construction, two jetting wells would be installed within the iron media. These jetting wells would allow for rejuvenating the iron media by flushing out solids or biological growth which could foul or clog the reactive wall. The implementation of this alternative would likely be more difficult that the other leachate alternatives due to required depth of excavation and underground utilities. This alternative would comply with RAOs for leachate immediately upon completion of installation. However, soil concentrations up gradient of the wall would not meet RAOs for some time. The estimated costs for this alternative are as follows:

Capital:	$5,659,000
Annual O&M:	$7,000
Total Present Worth:	**$5,911,000**

SCL-4E: Install Injection Wells Along the Northwestern Boundary of the GMZ and Within the Source Area/Install Air Sparging Unit/Inject Air Restriction On Groundwater Usage

Alternative SCL-4E includes all the same elements as SCL-4C. In addition to the air injection wells installed at the GMZ boundary under SCL-4C, this alternative includes air injection wells located at the source. The addition of air injection wells at the source make this alternative more effective but more costly than alternative SCL-4C. This alternative would comply with RAOs after approximately 15 to 25 years. The estimated costs for this alternative are as follows:

Capital:	$2,306,000
Annual O&M:	$57,000
Total Present Worth:	**$2,796,000**

SOURCE AREA 7

Source Area 7 - Soil

SCS-7A: No Action

For Alternative SCS-7A, no remedial actions would be undertaken. Soil contaminants would remain on-site and would not be reduced in volume, treated, or contained. Computer modeling predicted that the time to meet state groundwater standards at the GMZ under this alternative would be approximately 80 - 90 years. There are no costs to implement this alternative.

SCS-7B: Limited Action (restrictions on soil usage)

Alternative SCS-7B includes placing access and use restrictions on contaminated soils. Access and use restrictions would be instituted to prevent future site development. Warning signs would be installed to prevent unauthorized persons from excavating soils. As with SCS-7A, soil contaminants would remain on-site and would not be reduced in volume, treated, or contained. This alternative would not comply with RAOs for 80 to 90 years. The estimated costs for this alternative are as follows:

Capital:	$69,000
Annual O&M:	$200
Total Present Worth:	**$275,000**

SCS-7C: Soil Excavation with Ex-Situ Biological Treatment in Biopiles

Under this alternative, contaminated soils would be excavated and treated on site. Alternative SCS-7C would include dewatering and excavation of approximately 57,000 cubic yards of material for on-site biotreatment. Although bioremediation is not a presumptive remedy for VOCs in soil, this technology would achieve remediation goals. Alternative SCS-7C would include the installation of well points for dewatering at a flow rate of 10 gpm to lower the water table to expose the residual NAPL. The water collected during the dewatering process will be contained on-site in two 21,000 gallon carbon steel tanks, and transported to an appropriate disposal facility at a frequency to be determined during the design phase. The soil would then be excavated and stockpiled for processing. Due to the levels of VOCs expected during excavation, the cost to install a temporary enclosure over the excavation has been included. Contaminated vapors will be collected and passed through granular activated carbon prior to release to the atmosphere.

The excavated soil will be screened to remove all particles greater than two inches in size, although slightly larger particle sizes may be allowable. On-site staging areas would be constructed and soils would be piled on high density polyethylene (HDPE) liners with fine sand layers above and below to maintain liner integrity. The approximate soil pile dimensions would be 6 feet tall with the base of the pile measuring 16 feet across and the top of the pile measuring 5 feet across. Water and nutrients (i.e., nitrogen and phosphorus) would be added periodically as needed for optimal biological activity. In addition, pH would be controlled by the addition of lime and/or acid. Piping would be installed below the piles within the fine sand layer above the HDPE lines. The piping will collect leachate produced by the piles. Following collection, the leachate will be recycled and used for watering the piles as previously described. A mechanical mixer would blend the soil to enhance microorganism/contaminant interactions and aeration, thereby enhancing biodegradation rates of contaminants. Soils that meet the remediation goals will be placed back into the excavated areas upon approval by the Agencies. The estimated duration for the treatment of the 57,000 cubic yards of soil is approximately 5 years. Although actual soil treatment would be completed in 5 years, this alternative would comply with RAOs after approximately 15 to 25 years when ARARs are met at the GMZ. The estimated costs for this alternative are as follows:

Capital:	$15,647,000
Annual O&M:	$627,000
Total Present Worth:	**$18,218,000**

SCS-7D: Excavation and On-Site Thermal Treatment with low-temperature thermal desorption followed by afterburner

Under this alternative, approximately 57,000 cubic yards of contaminated soils would be excavated for on-site thermal treatment via a LTTD unit. Low temperature Thermal Desorption is a presumptive remedy for VOCs in soil although it is not U.S. EPA's *preferred* technology. In this alternative, soils excavation, site dewatering/treatment,

and excavation enclosure would all be performed as described for alternative SCS-7C.

Excavated soils would be screened to remove particles greater than four inches in size and then conveyed to the LTTD unit. Following primary treatment unit where the contaminants are vaporized from the soil, contaminant vapors are destroyed in the afterburner. The treated soil is then conveyed to a process unit that cools and re-hydrates the soil. The soil is stockpiled for testing to ensure that the clean-up goals have been achieved. The production rate of this system ranges from 80 to 120 tons per hour depending on soil type and moisture content. Based on this rate, the estimated duration of the thermal treatment is eight months. Although actual soil treatment would be completed in 8 months, this alternative would comply with RAOs after approximately 10 to 20 years. The estimated costs for this alternative are as follows:

Capital:	$15,124,000
Annual O&M:	$85,000
Total Present Worth:	**$15,209,000**

SCS-7E: Soil Vapor Extraction and Air Sparging System with vapor treatment by catalytic oxidation

Alternative SCS-7E is the proposed alternative for soils at Area 7. Soil Vapor Extraction is the preferred presumptive remedy for soils contaminated with VOCs. This alternative would combine soil vapor extraction and air sparging technologies to address contaminants in unsaturated and saturated soil and leachate in Source Area 7. Under this alternative, unsaturated and saturated contaminated soils would be remediated in situ via a vapor extraction system. This alternative will consist of the installation of a series of wells connected by an underground piping system. A blower will provide the source of negative pressure to extract vapors from the subsurface. Sixteen vacuum extraction wells will be placed in the suspected source areas. The wells will be constructed to a depth of up to 25 feet and screened in the vadose zone, where they will extract volatile contaminants from the unsaturated zone as well as some leachate contaminants, which are able to volatilize from the surface of the water table. The estimated flow rate for the SVE system is 1200 standard cubic feet per minute (scfm). A pilot test would be conducted prior to system design to determine well construction, extraction flow rate, and spacing.

The air sparge system would be constructed to volatilize VOCs from saturated soils and leachate through the injection of air. The VOCs would be collected using vapor extraction wells. A total of 57 air sparge wells would be constructed to a depth of 50 feet bgs. Camp Dresser and McKee has assumed a radius of influence of 25 feet for the air sparging wells. Two air compressors would be used to inject air to the subsurface, each at a rate of 400 scfm, for a total of 800 scfm. However, a pilot study would be conducted to verify flow rate and the radius of influence prior to full-scale implementation.

Given the presence of residual NAPL, it is expected that significant concentrations of contaminated vapors will be extracted. The extracted vapors will be treated with a catalytic oxidation unit. Carbon adsorption would not be a cost-effective technology for treating the vapor upon startup of the soil vapor extraction systems. However, it is noted that carbon adsorption could be used to address contaminants in the vapor after contaminant concentration levels were reduced using catalytic oxidation for a period of up to six months to one year. This alternative would comply with RAOs after approximately 15 to 25 years. The estimated costs for this alternative are as follows:

Capital:	$3,071,000
Annual O&M:	$320,000
Total Present Worth:	**$5,624,000**

Source Area 7 - Leachate

Area 7 leachate remedies include institutional controls on groundwater usage within the GMZ as well as installation of monitoring wells and implementation of a groundwater and leachate monitoring program. The groundwater and leachate would be monitored at predetermined intervals for 30 years (per RCRA post-closure groundwater monitoring requirements). Monitoring will typically consist of collecting groundwater and analyzing for VOCs and, where appropriate, parameters that measure biological activity.

SCL-7A: No Action (leachate monitoring and restrictions on groundwater)

This alternative would consist of no action, with leachate monitoring and institutional controls on groundwater usage for Area 7. Leachate concentrations would continue to attenuate naturally. This alternative would comply with RAOs after approximately 80 to 90 years. The estimated costs for this alternative are as follows:

Capital:	$67,000
Annual O&M:	$9,000
Total Present Worth:	**$347,000**

SCL-7B: Multi-Phase Extraction/Leachate Containment/Collection with Treatment by Air Stripping/On-site Surface Discharge/Groundwater Use Restrictions

Alternative SCL-7B is the proposed alternative for Area 7 leachate. This alternative was designed to complement soil alternative SCS-7E. Alternative SCL-7B would include the installation of a *multi-phase extraction* (MPE) system to be implemented in the source and a leachate containment system to be implemented along the down gradient side of the GMZ. A leachate containment system consisting of eight leachate extraction wells, a central pump station, an air stripping unit, piping, and controls would be installed. The source area leachate will be collected via the leachate extraction wells to be located northwest of the park play ground area. The leachate would be extracted and pumped to the air stripping unit at a rate of 10 gpm. The treated effluent from the air stripper would be discharged on-site to the unnamed creek located

approximately 450 feet north of the source. Prior to discharging to the creek, the treated effluent would be monitored periodically to confirm that it meets discharge criteria. Vapors from the air stripping unit would be treated in the catalytic oxidation unit installed as a component of Alternative SCS-7E.

Ten MPE wells (approximately 25 feet deep) will be installed in the source and piped underground to a central vacuum pump/vapor treatment system enclosure. The enclosure would include an air/water separation system, with the water pumped to the air stripper installed for the leachate containment system. Air from the air/water separation system would be sent to the catalytic oxidation unit. This alternative would comply with RAOs after approximately 30 to 40 years. The estimated costs for this alternative are as follows:

Capital:	$1,435,000
Annual O&M:	$128,000
Total Present Worth:	**$2,637,000**

SCL-7C: Reactive Barrier Wall/Leachate Monitoring/ Groundwater Use Restrictions

Alternative SCL-7C would include the installation of a 2- foot thick reactive barrier wall which would consist of a funnel and gate system. The funnel wall component of the funnel and gate system would direct the contaminated leachate plume to the reactive treatment wall. The reactive wall would be comprised of a permeable reactive iron media and would be able to treat the corresponding leachate contaminants to acceptable levels. The reactive wall construction will include jetting wells to allow for rejuvenating the iron media by flushing out particulate matter or biological growth which could foul or clog the iron media. Alternative SCL-7C requires the installation of a 310-foot and 420-foot funnel wall located north and west of the source area leachate plume, respectively. The two funnel walls would be joined together with a 210-foot reactive gate positioned between the two walls. The western funnel wall will be tied into bedrock at approximately 50 feet bgs, while the northern funnel wall and reactive gate would be extended to a depth of 80 feet bgs. This alternative would comply with RAOs for leachate immediately upon completion of installation. However, soil concentrations up gradient of the wall would not meet RAOs for some time. The estimated costs for this alternative are as follows:

Capital:	$4,104,000
Annual O&M:	$8,000
Total Present Worth:	**$4,391,000**

SOURCE AREA 9/10

The description of alternatives for Areas 4 and 7 contained estimates based on computer modeling of the time required to meet state groundwater standards at the

GMZ boundary under each alternative. However, because of the inability to gather data for Area 9/10, no computer modeling could be performed for the soil and leachate alternatives. Therefore, the time to meet RAOs under each alternative for Area 9/10 is discussed qualitatively in comparison to one another.

Source Area 9/10 - Soil

SCS-9/10A: No Action

For Alternative SCS-9/10A, no remedial actions would be undertaken. Soil contaminants would remain on-site and would not be reduced in volume, treated, or contained. This alternative would take the longest amount of time to meet RAOs. There are no costs to implement this alternative.

SCS-9/10B: Limited Action (restrictions of future development)

Alternative SCS-9/10B includes placing use restrictions on the contaminated area. Use restrictions would be instituted to prevent future site development. As with SCS-9/10A, soil contaminants would remain on-site and would not be reduced in volume, treated, or contained. This alternative would take the same amount of time as alternative SCS-9/10A to reach RAOs. The estimated costs for this alternative are as follows:

Capital:	$28,000
Annual O&M:	$0
Total Present Worth:	**$28,000**

SCS-9/10C: Soil Vapor Extraction with vapor treatment using granular activated carbon

Alternative SCS-9/10C is the proposed alternative for soils at Area 9/10. Under this alternative, contaminated soils would be remediated in-situ via a SVE system. Soil Vapor Extraction is the preferred presumptive remedy for soils contaminated with VOCs. This alternative will consist of the installation of a series of wells connected by an underground piping system. A blower will provide the source of negative pressure to extract vapors from the subsurface. The wells will be screened in the vadose zone, where they will remove volatile contaminants from the unsaturated zone as well as some leachate contaminants which are able to diffuse from the surface of the water table. A pilot program would be conducted prior to the design of the SVE system to determine well spacing and in-situ air permeability.

The vapors collected from the SVE unit will be treated using granular activated carbon. Granular activated carbon can be used to treat the vapors at this area (as opposed to catalytic oxidation at Areas 4 and 7) due to the lower expected concentrations of contaminants extracted from the soils. The vapor treatment scenario may have to be reevaluated based on the results of additional data collection from Area 9/10 and the results of the SVE pilot program.

This alternative will meet RAOs in the shortest amount of time out of all Area 9/10 soil alternatives. The estimated costs for this alternative are as follows:

Capital:	$225,000
Annual O&M:	$329,000
Total Present Worth:	**$4,308,000**

Source Area 9/10 - Leachate

All Area 9/10 leachate remedies include institutional controls on groundwater usage within the GMZ as well as installation of monitoring wells and implementation of a groundwater and leachate monitoring program. The groundwater and leachate would be monitored at predetermined intervals for 30 years (per RCRA post-closure groundwater monitoring requirements). Monitoring will typically consist of collecting groundwater and analyzing for VOCs and, where appropriate, parameters which measure biological activity.

SCL-9/10A: No Action (leachate monitoring and restrictions on groundwater usage)

This alternative would consist of no action with leachate monitoring and institutional controls on groundwater usage. Leachate concentrations would continue to attenuate naturally. Future source area development would be restricted for the longest period time under this alternative as it would take the longest to reach RAOs. The estimated costs for this alternative are as follows:

Capital:	$60,000
Annual O&M:	$5,000
Total Present Worth:	**$217,000**

SCL-9/10B: Hydraulic Containment (leachate monitoring, leachate containment/collection and treatment by air stripping, off-site surface discharge, and groundwater use restrictions)

The Hydraulic Containment alternative would include installation of a leachate containment system. As part of the leachate containment system, 55 leachate extraction wells, piping, controls and an air stripping unit would be installed. Wells were utilized rather than a deep trench to protect the adjacent building structure. The source area leachate would be collected in leachate extraction wells installed west and south of the Sundstrand Plant #1. The leachate will be extracted from the extraction wells via pumps and sent to the air stripping unit at a rate of 50 gpm. The collected leachate will be treated in the air stripping unit. Vapors collected from air stripping unit will be treated by granular activated carbon and released to atmosphere. The treated water from the air stripping unit will be discharged off-site to a stormwater ditch located approximately 2,000 feet south of the source. This leachate alternative would achieve RAOs more quickly than SCL-9/10A, but not as quickly as the air sparging conducted under alternative SCL-9/10C. The estimated costs for this alternative are as follows:

Capital:	$1,326,000
Annual O&M:	$42,000
Total Present Worth:	**$2,440,000**

SCL-9/10C: Install Injection Wells along the Southwestern GMZ Boundary/Install Air Sparging Unit/Inject Air/Restriction On Groundwater Usage

Alternative SCL-9/10C includes the installation of air injection wells along the southwestern boundary of the GMZ and an air sparging unit. Similar to alternative SCL-4C, injection wells would be installed along the GMZ boundary to contain and treat the source area leachate. Air would be injected into the subsurface to volatilize the contaminant vapors to the vadose zone where they would be removed by vacuum extraction. The air sparging system would be required to operate in conjunction with an SVE system described in alternative SCS-9/10C. Vapors produced by air sparging will be collected in the SVE system. This alternative would achieve RAOs in a short amount of time, slightly longer than that required by SCL-9/10E. The estimated costs for this alternative are as follows:

Capital:	$2,293,000
Annual O&M:	$65,000
Total Present Worth:	**$3,208,000**

SCL-9/10D: Reactive Barrier Wall/Leachate Monitoring/Restrictions on Groundwater Usage

SCL-9/10D is the proposed alternative for leachate at Area 9/10. Alternative SCL-9/10D would include the installation of a reactive barrier wall that would consist of a funnel and gate system. The reactive barrier system would be constructed of iron media to treat the leachate as it flows through the reactive wall. The reactive wall construction will include jetting wells to allow for rejuvenating the iron media by flushing out particulate matter or biological growth which could foul or clog the iron media. This alternative would comply with RAOs for leachate immediately upon completion of installation. However, soil concentrations up gradient of the wall would not meet RAOs for some time. The estimated costs for this alternative are as follows:

Capital:	$3,329,000
Annual O&M:	$5,000
Total Present Worth:	**$3,523,000**

SCL-9/10E: Install Injection Wells Along Boundary of the GMZ and Source Area/Install Air Sparging Unit/Inject Air/Restriction On Groundwater Usage

Alternative SCL-9/10E is essentially the same as Alternative SCS9/10C except that additional air sparging wells will be installed at the source area, in addition to the GMZ boundary. As with Alternative SCS9/10C, the air sparging system would be required to

operate in conjunction with an SVE system described in alternative SCS-9/10C. Vapors produced by air sparging will be collected in the SVE system. This alternative would achieve RAOs in a relatively short amount of time, second only to Alternative SCL-9/10D. The estimated costs for this alternative are as follows:

Capital:	$2,697,000
Annual O&M:	$65,000
Total Present Worth:	**$3,619,000**

SOURCE AREA 11

As mentioned previously, computer modeling performed on Area 11 predicted that for any alternative, dissolved contaminants would meet state groundwater standards at the GMZ boundary prior to intersecting the GMZ boundary. However, free product exists at the interior of the site and represents a principal threat. With the exception of SCS-11A (No Action), the alternatives evaluated for Area 11 are designed to address soil contamination overall, including free product.

Source Area 11 - Soil

SCS-11A: No Action

For Alternative SCS-11A, no remedial actions would be undertaken. Soil contaminants would remain on-site and would not be reduced in volume, treated, or contained. Free product is present at the interior of Area 11 and soil remediation objectives would not be met in some time. This alternative would take the longest amount of time to meet soil remediation objectives as well as RAOs at the interior of the site. There are no costs to implement this alternative.

SCS-11B: Limited Action (restrictions on future site development)

Alternative SCS-11B includes placing use restrictions on the contaminated area. Institutional controls would be implemented to prevent future site development. As with alternative SCS-11B, soil contaminants would remain on-site and would not be reduced in volume, treated, or contained. This alternative would require the same amount of time to achieve soil remediation objectives and RAOs as alternative SCS-11A. The estimated costs for this alternative are as follows:

Capital:	$28,000
Annual O&M:	$0
Total Present Worth:	**$28,000**

SCS-11C: Soil Vapor Extraction with vapor treatment using catalytic oxidation

This is the proposed alternative for Area 11 soils. Soil Vapor Extraction is the preferred presumptive remedy for soils contaminated with VOCs. Under this alternative, contaminated soils would be remediated in situ via a vapor extraction system. This alternative will consist of the installation of a series of wells connected by an underground piping system. A blower will provide the source of negative pressure to extract vapors from the subsurface. Five vacuum extraction wells will be placed in the source area. The wells will be screened in the vadose zone, where they will remove volatile contaminants from the unsaturated zone as well as some leachate

contaminants that are able to diffuse from the surface of the water table. Due to the presence of NAPL, it has been assumed that the wells will be constructed of carbon steel in case steam injection is required. A pilot program would be conducted prior to system design to determine well construction, spacing, and in-situ air permeability.

Given the presence of residual NAPL, it is expected that significant quantities of contaminated vapors will be extracted. The vapors will be treated with a catalytic oxidation unit. Carbon adsorption would not be a cost-effective technology for treating the vapor upon startup of the soil vapor extraction system. It is noted that carbon adsorption could be used to address contaminants in the vapor after contaminant concentration levels were reduced using catalytic oxidation for a period of up to six months to one year. This alternative would achieve soil remediation objectives and RAOs in the shortest amount of time out of all alternatives evaluated for Area 11. The estimated costs for this alternative are as follows:

Capital:	$543,500
Annual O&M:	$212,880
Total Present Worth:	**$3,185,500**

Source Area 11 - Leachate

As mentioned previously, no remedial alternatives (with the exception of the No Action Alternative) were developed for Area 11 leachate. The BIOSCREEN results indicate that even though LNAPL is present in the interior of the area, groundwater would meet state groundwater standards at the GMZ boundary. BIOSCREEN accounted for the 150 feet between the hot spot at Area 11 and the GMZ boundary. Modeled concentrations of benzene, xylene, and TCE all dropped below groundwater standards within 75 feet down gradient of the elevated soil concentrations (CDM, 2000 RI Appendix B). However, due to the presence of free product at the interior of the site, institutional controls on groundwater usage within the GMZ will be implemented, approximately four monitoring wells will be installed, and a groundwater and leachate monitoring program will be executed at Area 11.

SCL-11A: No Action (leachate monitoring and restrictions on groundwater usage)

This alternative would consist of no action with leachate monitoring and institutional controls on groundwater usage. This alternative would consist of no action with leachate monitoring, and institutional controls on groundwater usage for Area 11. Leachate concentrations would continue to attenuate naturally. The groundwater and leachate would be monitored at predetermined intervals for 30 years (per RCRA post-closure groundwater monitoring requirements). Monitoring will typically consist of collecting groundwater and analyzing for VOCs and, where appropriate, parameters that measure biological activity. Future source area development would be restricted under this alternative. The estimated costs for this alternative are as follows:

Capital:	$54,000
Annual O&M:	$8,000

Total Present Worth: $297,000

EVALUATION OF ALTERNATIVES

This Evaluation of Alternatives section explains the State's rationale for selecting the preferred alternative. The U.S. EPA has developed nine criteria to be used to evaluate remedial alternatives to ensure that all important considerations are factored into remedy selection decisions. These criteria are derived from the statutory requirements of the NCP Section 121 as well as other technical and policy considerations that have proven to be important for selecting among remedial alternatives. The chart entitled Description of Evaluation Criteria on the following page identifies and defines the nine criteria.

In total, the Feasibility Study for OU 3, presented detailed analysis for 28 different alternatives. Because the modifying criteria cannot be fully evaluated until public comment is received, they were not evaluated in the FS nor will they be evaluated within this section of the proposed plan. The detailed analysis of the remaining 7 criteria for each alternative is summarized below. Due to the large number of alternatives, an in-depth, detailed analysis for each of the will not be provided. This information is available within the FS. Additionally, the alternatives will be evaluated in groups by source area and media (soil or leachate). The No Action Alternative will only be discussed for Area 11 leachate. The No Action Alternative will not be discussed for any other media or source area, as it failed to be protective of human health and the environment in all cases except for leachate at Area 11. References to "all alternatives" in discussions below should be considered to exclude the No Action Alternative as well as any other alternatives specific to the subject Source Area and media that do not meet threshold criteria.

Area 4 Soil

In addition to the No Action alternative, Alternative SCS-4B will not be discussed within this section because it failed to meet either threshold criteria. The summary of the detailed analysis for Area 4 Soil is provided below for Alternatives SCS-4C (SVE) and SCS-4D (Excavation with LTTD).

Overall Protection of Human Health and the Environment

Both SCS-4C and SCS-4D are protective of human health and the environment. SCS-4D achieves soil remediation objectives in less than 1 year.

Compliance with ARARs

Both alternatives comply with ARARs.

Long-term Effectiveness and Permanence

Alternative SCS-4D is more permanent (soils are removed and treated) than SCS-4C and has less residual risk once excavation is complete. Also, SCS-4D does not require any long-term operation and maintenance, whereas the SVE system under SCS-4C would require maintenance until remediation objectives are met after approximately 20 - 30 years.

Description of Evaluation Criteria

Threshold Criteria

The two most important criteria are statutory requirements that must be satisfied by any alternative in order for it to be eligible for selection.

1. **Overall protection of human health and environment** addresses whether or not a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment engineering controls or institutional controls.
2. **Compliance with *ARARs*** addresses whether or not a remedy will meet all of the **A**pplicable or **R**elevant and **A**ppropriate **R**equirements of other Federal and State environmental statutes and/or provide grounds for invoking a waiver.

Primary Balancing Criteria

Five primary balancing criteria are used to identify major trade-offs between remedial alternatives. These trade-offs are ultimately balanced to identify the preferred alternative and to select the final remedy.

1. **Long-term effectiveness and permanence** refers to the magnitude of residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time once cleanup goals have been met.
2. **Reduction of toxicity, mobility, or volume through treatment** is the anticipated performance of the treatment technologies that may be employed in a remedy.
3. **Short-term effectiveness** refers to the speed with which the remedy achieves protection, as well as the remedy's potential to create adverse impacts on human health and the environment that may result during the construction and implementation period.
4. **Implementability** is the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement the chosen solution.
5. **Cost** includes capital and operation and maintenance costs.

Modifying Criteria

These criteria may not be considered fully until after the formal public comment period on the Proposed Plan and RI/FS Report are complete. However, Illinois EPA and U.S. EPA work closely with the community throughout the project.

1. **State Acceptance** indicates whether, based on its review of the RI and Proposed Plan, the State concurs with, opposes, or has no comment on the preferred alternative.
2. **Community Acceptance** will be assessed in the Record of Decision following a review of the public comments received on the RI report and the Proposed Plan

Reduction of Toxicity, Mobility, or Volume through Treatment
Alternative SCS-4D achieves a higher degree of reduction of toxicity, mobility and volume of contaminants as opposed to SCS-4C. Under SCS-4D, greater than 90% of contaminant mass would be removed as compared to 85% removal using SCS-4C.
Short-term Effectiveness
Alternative SCS-4C results in a smaller short-term health risk to on-site workers and surrounding community as the contaminants are left in place. Under the SCS-4D, the contaminants would be excavated, providing more of an opportunity for exposure, but improved rate of contaminant removal.
Implementation
Both alternatives are technically easy to implement. Some space considerations must be made with alternative SCS-4D as the treatment unit will be larger than that under SCS-4C.
Cost
The total present worth costs for Alternative SCS-4C is $2,156,000 as compared to SCS-4D's $2,121,000.

Area 4 Leachate
The summary of the detailed analysis for Area 4 Leachate is provided below for Alternatives SCL-4B (Hydraulic Containment); SCL-4C (Air Sparging at GMZ Boundary); SCL-4D (Reactive Barrier Wall); and SCL-4E (Air Sparging at Source and GMZ Boundary).
Overall Protection of Human Health and the Environment
All alternatives evaluated for Area 4 Leachate are protective of human health and the environment. However, only SCL-4D stops contaminants entirely (and in an immediate manner) from moving outside the GMZ boundary for Area 4.
Compliance with ARARs
All alternatives comply with ARARs. Alternative SCL-4D complies with ARARS in the shortest amount of time.
Long-term Effectiveness and Permanence
All alternatives require some degree of operation and maintenance. Alternative SCL-4E is the most effective as it addresses contaminants within hot spots.
Reduction of Toxicity, Mobility, or Volume through Treatment
Alternative SCL-4B provides the least reduction in toxicity, mobility and volume of contaminants as opposed to all others. Alternative SCL-4D provides the highest degree of reduction in toxicity, mobility and volume of contaminants, as contaminants are treated while passing through the reactive barrier wall.
Short-term Effectiveness
All alternatives cause limited exposure to subsurface contaminants during construction. Alternative SCL-4D is the most effective in the short term.
Implementation
Alternative SCL-4D is the most difficult to implement due to excavation and dewatering requirements. Alternative SCL-4B is the easiest.

Cost

The total present worth costs for Area 4 Leachate alternatives are as follows: SCL-4B ($732,000); SCL-4C ($2,522,000); SCL-4D ($5,911,000); SCL-4E ($2,796,000).

Area 7 Soil

In addition to the No Action Alternative, Alternative SCS-7B will not be discussed within this section because it failed to meet either threshold criteria. The summary of the detailed analysis for Area 7 Soil is provided below for Alternatives SCS-7C (Excavation and Biological Treatment); SCS-7D (Excavation and On-site Low Temperature Thermal Desorption); SCS-7E (Soil Vapor Extraction and Air Sparging).

Overall Protection of Human Health and the Environment

All alternatives evaluated for Area 7 Soil are protective of human health and the environment. However, SCS-7C and SCS-7D achieve soil preliminary remediation goals in 2 years or less as opposed to the 15 to 20 years required for SCS-7E.

Compliance with ARARs

Alternative SCS-7D complies with ARARS immediately upon the completion of excavation. All other alternatives require additional time to meet ARARs, but eventually do.

Long-term Effectiveness and Permanence

All alternatives provide adequate effectiveness and permanence. Alternative SCS-7E is the least effective and permanent because contaminants are treated in-situ, and therefore rely on operation and maintenance of SVE system. Alternative SCS-7D is the most permanent as contaminants are excavated and thermally destroyed above ground.

Reduction of Toxicity, Mobility, or Volume through Treatment

All alternatives provide adequate reduction in toxicity, mobility and volume of contaminants. Alternative SCS-4E provides the least reduction in toxicity, mobility and volume of contaminants (approximately 85%) as opposed to all others. However, after extraction, the thermal treatment unit provides greater than 95% reduction in , contaminant reduction in toxicity within the vapors. Alternative SCS-7D provides the largest overall reduction in toxicity, mobility and volume of contaminants at greater than 90% effectiveness.

Short-term Effectiveness

Alternatives SCS-7C and SCS-7D are very effective in the short term as contaminants are removed through excavation. However, these alternatives also have the highest short-term risks to on-site workers and the community as VOCs could be released during the excavation.

Implementability

All alternatives are relatively easy to implement and are technically feasible.

Cost

The total present worth costs for Area 7 Soil alternatives are as follows: SCS-7C ($18,218,000); SCS-7D ($15,209,000); and SCS-7E ($5,624,000).

Area 7 Leachate

The summary of the detailed analysis for Area 7 Leachate is provided below for Alternatives SCS-7B (Multi-phase Extraction/ Leachate Containment and Treatment); and SCL-7C (Reactive Barrier Wall).

Overall Protection of Human Health and the Environment

Both alternatives evaluated for Area 7 Leachate are protective of human health and the environment. However, only SCL-7C, the reactive barrier wall, stops contaminants entirely (and in an immediate manner) from moving outside the GMZ boundary for Area 7.

Compliance with ARARs

Both alternatives comply with ARARs. Alternative SCS-7D complies with ARARS in the shortest amount of time.

Long-term Effectiveness and Permanence

Both alternatives provide an adequate degree of effectiveness and permanence. Alternative SCL-7B provides a higher degree of permanence as the NAPL is addressed directly through extraction.

Reduction of Toxicity, Mobility, or Volume through Treatment

Alternative SCL-7B provides the greatest reduction in toxicity, mobility and volume of contaminants as treatment occurs within the hot spots.

Short-term Effectiveness

Alternative SCL-7C is the most effective in the short term, as contaminants would be treated immediately as they pass through the barrier wall.

Implementation

Alternative SCL-7C is the most difficult to implement due to excavation and dewatering requirements to install the wall within trench.

Cost

The total present worth costs for Area 7 Leachate alternatives are as follows: SCL-7B ($2,6370,00); and SCL-7C ($4,391,000).

Area 9/10 Soil

In addition to the No Action Alternative, Alternative SCS-9/10B will not be discussed within this section because it failed to meet either threshold criteria. The summary of the detailed analysis for Area 9/10 Soil is provided below for Alternative SCS-9/10C (Soil Vapor Extraction).

Overall Protection of Human Health and the Environment

Alternative SCS-9/10C is the only alternative that is protective of human health and the environment.

Compliance with ARARs

Alternative SCS-9/10C would comply with ARARS in a reasonable time frame.

Long-term Effectiveness and Permanence

Alternative SCS-9/10C is the most effective and permanent, although contaminants are treated in-situ, and therefore rely on operation and maintenance of SVE system.

Reduction of Toxicity, Mobility, or Volume through Treatment

Alternative SCS-9/10C provides the greatest reduction in toxicity, mobility and volume of contaminants (approximately 85%) as opposed to all others.

Short-term Effectiveness
Alternative SCS-9/10C provides a medium level of short-term effectiveness. The SVE system will require a certain amount of time to achieve remediation goals. Short-term risks to on-site workers and the community are minimal as soils would be treated in-situ.

Implementation
Soil Vapor Extraction under SCS-9/10C is relatively easy to implement however space considerations exist.

Cost
The total present worth costs for Alternative SCS-9/10C is $4,308,000.

Area 9/10 Leachate
The summary of the detailed analysis for Area 9/10 Leachate is provided below for Alternatives SCL-9/10B (Hydraulic Containment); SCL-9/10C (Air Sparging at GMZ Boundary); SCL-9/10D (Reactive Barrier Wall); and SCL-9/10E (Air Sparging at Source and GMZ Boundary).

Overall Protection of Human Health and the Environment
All alternatives evaluated for Area 9/10 Leachate are protective of human health and the environment. However, only SCL-9/10D, the reactive barrier wall stops contaminants entirely (and in an immediate manner) from moving outside the GMZ boundary for Area 9/10.

Compliance with ARARs
All alternatives comply with ARARs. Alternative SCS-9/10D complies with ARARS in the shortest amount of time.

Long-term Effectiveness and Permanence
All alternatives require some degree of operation and maintenance. Alternative SCL-9/10E best meets this criteria, as the degree of residual risk after remediation objectives are achieved is small. This is because SCL-9/10E addresses contaminants within hot spots.

Reduction of Toxicity, Mobility, or Volume through Treatment
Alternative SCL-9/10B provides the least reduction in toxicity, mobility and volume of contaminants as opposed to all others. As contaminants pass through the reactive barrier wall, Alternative SCL-9/10D provides the highest degree of reduction in toxicity, mobility and volume of contaminants.

Short-term Effectiveness
All alternatives cause limited exposure to subsurface contaminants during construction. Alternative SCL-9/10D is the most effective in the short term.

Implementation
Alternative SCL-9/10D is the most difficult to implement due to excavation and dewatering requirements. Alternatives SCL-9/10C, SCL-9/10D, and SCL9/10E all face some difficulty due to construction beneath 9th Street. Alternative SCL-9/10B would be the easiest to implement.

Cost
The total present-worth costs for Area 9/10 Leachate alternatives are as follows: SCL-9/10B ($2,440,000); SCL-9/10C ($3,208,000); SCL-9/10D ($3,523,000); SCL-9/10E ($3,619,000).

Area 11 Soil
In addition to the No Action Alternative, Alternative SCS-11B will not be discussed within this section because it failed to meet either threshold criteria. The summary of the detailed analysis for Area 11 Soil is provided below for Alternative SCS-11C (Soil Vapor Extraction).

Overall Protection of Human Health and the Environment
Alternative SCS-11C is the only alternative that is protective of human health and the environment.

Compliance with ARARs
Alternative SCS-11C would comply with ARARS IN a reasonable time frame.

Long-term Effectiveness and Permanence
Alternative SCS-11C is the most effective and permanent, although contaminants are treated in-situ, and therefore rely on operation and maintenance of SVE system.

Reduction of Toxicity, Mobility, or Volume through Treatment
Alternative SCS-11C provides the greatest reduction in toxicity, mobility and volume of contaminants (approximately 85%) as opposed to all others.

Short-term Effectiveness
Alternative SCS-11C provides a medium level of short-term effectiveness. The SVE system will require a certain amount of time to achieve remediation goals. Short-term risks to on-site workers and the community are minimal as soils would be treated in-situ.

Implementability
Soil Vapor Extraction under SCS-11C is relatively easy to implement however space considerations exist.

Cost
The total present worth costs for Alternative SCS-11C is $3,185,000.

Area 11 Leachate
The summary of the detailed analysis for Area 11 Leachate is provided below for Alternative SCL-11A (No Action)

Overall Protection of Human Health and the Environment
The No Action alternative is protective of human health and the environment.

Compliance with ARARs
Alternative SCL-11A complies with ARARs.

Long-term Effectiveness and Permanence
Alternative SCL-11A requires a degree of operation and maintenance as on-going groundwater sampling will be required. Alternative SCL-11A meets this criteria. Groundwater contamination will continue to degrade naturally.

Reduction of Toxicity, Mobility, or Volume through Treatment
Alternative SCL-11A will reduce toxicity, mobility and volume of contaminants through natural degradation.
Short-term Effectiveness
Alternative SCL-11A is effective in the short term. Low-level exposure to subsurface contamination may occur during installation of monitoring wells and sampling events.
Implementation
Alternative SCL-11A is straightforward to implement.
Cost
The total present worth costs for Alternative SCL-11A is $297,000.

PREFERRED ALTERNATIVES

This section describes the preferred alternatives for each source area and provides Illinois EPA's reasoning behind its selection. The preferred alternatives can change based on comments received on this proposed plan or new information made available to Illinois EPA. The description of the proposed alternatives will be separate based on the source area.

Area 4
Alternatives SCS-4D (Excavation and On-site Low Temperature Thermal Desorption) and SCL-4B (Hydraulic Containment) are the preferred alternatives for Area 4. The combination of these alternatives achieve substantial risk reduction by removing the source materials that constitute principal threats as well as removing contaminated soil and groundwater surrounding the source materials. The excavation of contamination and thermal treatment coupled with leachate containment reduces risks more quickly and cost effectively than the other alternatives.

Under these alternatives, approximately 2,800 cubic yards of contaminated soils would be excavated and VOCs would be removed through on-site thermal treatment via a LTTD unit. Excavated soils would be conveyed to the primary treatment unit where the contaminants are thermally desorbed from the soil. Due to the levels of VOCs expected during excavation, the cost to install a temporary enclosure over the excavation for emissions control has been included. Contaminated vapors will be collected from the temporary enclosure and directed to the afterburner used in conjunction with the LTTD unit. The vapors produced within the thermal desorption unit will be destroyed in an afterburner. The treated soil is then conveyed to a process unit that cools and re-hydrates the soil. The treated soil will be stockpiled, and following testing to ensure that remediation goals have been achieved, would be placed back into the excavation.

Well points will be installed to lower the water table to expose the residual NAPL. The water collected during the dewatering process will be contained on site in two 21,000-gallon carbon steel tanks, and transported to an appropriate disposal facility at a frequency to be determined during the design phase. It would take approximately one month to thermally process the soil.

Following the completion of the soils excavation and thermal treatment, the leachate containment and treatment system would be installed. The leachate will be contained and extracted at a rate of approximately 20 gpm through as series six leachate extraction wells, submersible pumps, piping, and controls. An air stripping unit would treat the extracted leachate. The treated effluent would be discharged on-site to a stormwater ditch. The effluent would be monitored periodically for VOCs to confirm that the leachate is treated to acceptable levels. Vapors stripped from the leachate in the air stripping unit would be directed to an on-site GAC unit. It is expected that under these alternatives, Area 4 will meet RAOs in less than 15 years.

Institutional controls will be placed on groundwater usage within the GMZ, monitoring wells will be installed, and a groundwater and leachate monitoring program will be implemented. The total present worth cost these alternatives is $2,853,000.

Polynuclear Aromatic Hydrocarbons were identified as COCs in soils at Area 4. Polynuclear Aromatic Hydrocarbons are not purposefully addressed by SCS-4D, although some remediation may occur incidentally (LTTD is not 100% effective on PAHs). Additional data will be obtained during remedial design to determine if PNAs are truly COCs due to industrial activities at Area 4, or simply contamination from other activities (i.e. naturally occurring sources or non-industrial human activities).

If the evaluation conducted during design identifies the need for remediation in addition to that outlined within this proposed plan and upcoming ROD, the remedy would be appropriately altered. Depending on the significance of the change in remedy, the Agencies may be required to hold additional public meetings and allow public comment on the new remedy.

The proposed alternatives for Area 4 will meet all RAOs for Area 4. The table below describes each RAO and how the alternatives will meet them.

Remedial Action Objective	**Prevent the public from contact with soil containing contamination in excess of state or federal standards or that poses a threat to human health**
How Alternative will meet RAO	Soils containing contamination in excess of state or federal standards or that poses a threat to human health will be excavated and treated by LTTD.
Remedial Action Objective	**Prevent the public from inhalation of airborne contaminants in excess of state or federal standards or that pose a threat to human health**
How Alternative will meet RAO	Soils containing contamination in excess of state or federal standards or that poses a threat to human health will be excavated and treated by LTTD.
Remedial Action Objective	**Prevent the migration of contamination from the source area that would result in degradation of site-wide groundwater or surface water to levels in excess of state or federal standards or that pose a threat to human health or the environment**

How Alternative will meet RAO	The removal of free product as well as those soils containing contamination in concentrations contributing to groundwater contamination in excess of ARARs will be excavated and treated. Following the LTTD, the leachate containment system will extract remaining leachate contamination until ARARs are met at the GMZ boundary.

The excavation of soils and NAPL followed by LTTD will remove and treat the principal threat wastes from Source Area 4. Based on information currently available, the lead agency believes the Preferred Alternative meets the threshold criteria and provides the best balance of tradeoffs among the other alternatives with respect to the balancing and modifying criteria. The Illinois EPA expects the Preferred Alternative for Area 4 to satisfy the following statutory requirements of CERCLA § 121(b): (1) be protective of human health and the environment; (2) comply with ARARs (or justify waiver); (3) be cost effective; (4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and (5) satisfy the preference for treatment as a principal element, or explain why the preference for treatment will not be met.

Area 7

Alternatives SCS-7E (Soil Vapor Extraction and Air Sparging) and SCL-7B (Multi-phase Extraction with Leachate Containment and Treatment) are the preferred alternatives for Area 7. These alternatives are recommended because they will achieve substantial risk reduction in consideration of cost. Alternatives SCS-7E and SCL-7B reduce risks substantially by treating the source materials constituting principal threats at the site.

Under these alternatives the in-situ technologies soil vapor extraction, air sparging, and multi-phase extraction would work in concert to treat contaminants in unsaturated and saturated soil and leachate in Source Area 7. The SVE system would extract vapors from the suspected hot spots through sixteen vacuum extraction wells. The wells will be constructed to a depth of up to 25 feet and screened in the vadose zone, where they will extract volatile contaminants from the unsaturated zone as well as some leachate contaminants, which are able to volatilize from the surface of the water table. The estimated flow rate for the SVE system is 1200 standard cubic feet per minute (scfm).

The air sparge system would be constructed to volatilize VOCs from saturated soils and leachate through the injection of air. The VOCs would be collected through the SVE system. A total of 57 air sparge wells would be constructed to a depth of 50 feet bgs. CDM has assumed a radius of influence of 25 feet for the air sparging wells. Two air compressors would be used to inject air to the subsurface, each at a rate of 400 scfm, for a total of 800 scfm.

A multi-phase extraction (MPE) system would focus on the hot spot areas where either highly contaminated soils or NAPL exists. The MPE system will extract a combination of the following phases: NAPLs, groundwater (leachate), and soil vapor. Ten MPE wells will be installed into the hot spots to a depth of approximately 25 feet.

Lastly, a leachate containment system consisting of eight leachate extraction wells, a central pump station, an air stripping unit, piping, and controls would be installed. The containment system would focus on contaminated leachate along the down gradient side of the GMZ. The leachate would be collected in the extraction wells and pumped to the air stripping unit at a rate of 10 gpm.

The SVE, MPE, and leachate containment systems would pipe contaminants to a central treatment building in the form of vapors, NAPL, and leachate. Vapors would be sent directly to a catalytic oxidation system for treatment. Leachate and NAPL will be separated from each other through an oil/water separator. The NAPL that is collected will be sent off-site for treatment. Leachate that is collected will be directed to an on-site air stripper. The vapors containing VOCs stripped from the leachate would then be directed to the catalytic oxidation system. Treated water collected within the central treatment unit will be discharged on-site to the unnamed creek located approximately 450 feet north of the hot spots.

Recovered NAPLs, groundwater and soil vapor will be piped underground to a central vacuum pump/vapor treatment system enclosure. The enclosure would also include an air/water separation system, with the water pumped to the leachate containment system air stripper. This alternative should comply with RAOs after approximately 15 to 25 years.

Institutional controls will be placed on groundwater usage within the GMZ, monitoring wells will be installed, and a groundwater and leachate monitoring program will be implemented. The estimated total present worth cost for these alternatives is $8,261,000.

Because Illinois EPA was unable to quantitatively evaluate human health risks to residents who were exposed to creek surface water and sediments in Area 7, additional data will be obtained during the design phase from the creek. Following data collection, risks to human health will be quantitatively evaluated.

Similarly, additional data will be collected from the creek during the design phase of the project to complete the ecological risk assessment. The design phase will likely occur in 2001. If the additional human health or ecological risk evaluations conducted during design identify the need for remediation in addition to that outlined within this proposed plan and upcoming ROD, the remedy would be appropriately altered. Depending on the significance of the change in remedy, the Agencies may be required to hold additional public meetings and allow public comment on the new remedy.

The proposed alternatives for Area 7 will meet all RAOs for Area 7. The following table describes each RAO and how the alternatives will meet them.

Remedial Action Objective	**Prevent the public from contact with soil containing contamination in excess of state or federal standards or that poses a threat to human health**
How Alternative will meet RAO	Soil containing contamination in excess of state or federal standards or that poses a threat to human health will be treated by a combination of SVE and MPE. Increased airflow caused by SVE and MPE will remove contaminants from soils and promote biodegradation.
Remedial Action Objective	**Prevent the public from inhalation of airborne contaminants in excess of state or federal standards or that pose a threat to human health**
How Alternative will meet RAO	Soil containing contamination in excess of state or federal standards or that poses a threat to human health will be treated by a combination of SVE and MPE. Increased airflow caused by SVE and MPE will remove contaminants from soils and promote biodegradation.
Remedial Action Objective	**Prevent the migration of contamination from the source area that would result in degradation of site-wide groundwater or surface water to levels in excess of state or federal standards or that pose a threat to human health or the environment**
How Alternative will meet RAO	A combination of SVE, MPE, and air sparging will remove free product and the contamination from soils that contain concentrations contributing to site-wide groundwater contamination in excess of ARARs. Leachate and soil contaminants below the water table will be treated by a combination of air sparging, and leachate containment, which will be achieved by leachate collection via extraction wells. The leachate containment system will extract remaining leachate contamination until ARARs are met at the GMZ boundary.
Remedial Action Objective	**Prevent the public from ingestion and direct contact with surface water containing contamination in excess of state or federal standards or that pose a threat to human health**
How Alternative will meet RAO	The removal of free product, contaminated soils, and contaminated groundwater will reduce the possibility that Area 7 groundwater contamination might impact the creek north of the park. Additional sampling will determine if levels within the creek pose a threat to human health.
Remedial Action Objective	**Prevent the migration of contamination from Source Area 7 that would result in degradation of surface water and sediment in the unnamed creek to levels in excess of state or federal standards or that pose a threat to human health or the environment**
How Alternative will meet RAO	The removal of free product, contaminated soils, and contaminated groundwater will reduce the possibility that Area 7 groundwater contamination might impact the creek north of the park. Additional sampling will determine if levels within the creek pose a threat to the environment.
Remedial Action Objective	**Prevent the migration of contamination from Source Area 7 that would result in the contamination of home-grown vegetables at concentrations which would pose a threat to human health**
How Alternative will meet RAO	The removal of free product, contaminated soils, and contaminated groundwater will reduce the possibility that Area 7 contamination might impact home-grown vegetables and fruits.

The extraction of NAPL and implementation of SVE in combination with air sparging will remove and treat the principal threat wastes from Source Area 7. Based on information currently available, the lead agency believes the Preferred Alternative for Area 7 meets the threshold criteria and provides the best balance of tradeoffs among the other alternatives with respect to the balancing and modifying criteria. The Illinois EPA expects the Preferred Alternative to satisfy the following statutory requirements of CERCLA § 121(b): (1) be protective of human health and the environment; (2) comply with ARARs (or justify waiver); (3) be cost effective; (4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and (5) satisfy the preference for treatment as a principal element, or explain why the preference for treatment will not be met.

Area 9/10

Alternatives SCS-9/10C (Soil Vapor Extraction) and SCL-9/10D (Reactive Barrier Wall System) are the preferred alternatives for Area 9/10. These alternatives are recommended because following a more thorough investigation; they will provide substantial risk reduction by treating the source materials constituting principal threats at the site. The combination of SVE and reactive barrier wall reduce risks in the shortest amount of time for a reasonable cost.

Under these alternatives, contaminated soils would be remediated in-situ via an SVE system and leachate would be treated through the use of a reactive barrier wall. Four vacuum extraction wells will be screened in the vadose zone, where they will remove volatile contaminants from the unsaturated zone as well as some leachate contaminants that are able to diffuse from the surface of the water table. The vapors collected from the SVE unit will be treated using granular activated carbon. Following treatment, the vapors will be released to the atmosphere. A thorough investigation could not be completed at Area 9/10 due to concern over underground utilities, so additional data will need to be collected in this area prior to constructing the remedy. The vapor treatment scenario may have to be reevaluated based on the results of additional data collection from Area 9/10 and the results of the SVE pilot program.

The reactive barrier wall would consist of a funnel and gate system. The reactive barrier system would be constructed of iron media to treat the leachate as it flows through the reactive wall. The reactive wall construction will include jetting wells to allow for rejuvenating the iron media by flushing out particulate matter or biological growth which could foul or clog the iron media.

Institutional controls will be placed on groundwater usage within the GMZ, monitoring wells will be installed, and a groundwater and leachate monitoring program will be implemented. The estimated present worth cost for these alternatives is $7,831,000.

Polynuclear Aromatic Hydrocarbons were identified as COCs in soils at Area 9/10. Polynuclear Aromatic Hydrocarbons are not purposefully addressed by SCS-9/10C. Additional data will be obtained during remedial design to determine if PNAs are truly COCs due to industrial activities at Area 9/10, or simply contamination from other

activities (i.e. naturally occurring sources or non-industrial human activities).

If the evaluation conducted during design identifies the need for remediation in addition to that outlined within this proposed plan and upcoming ROD, the remedy would be appropriately altered. Depending on the significance of the change in remedy, the agencies may be required to hold additional public meetings and allow public comment on the new remedy.

The proposed alternatives for Area 9/10 will meet all RAOs for Area 9/10. The table below describes each RAO and how the alternatives will meet them.

Remedial Action Objective	**Prevent the public from contact with soil containing contamination in excess of state or federal standards or that poses a threat to human health**
How Alternative will meet RAO	Soil containing contamination in excess of state or federal standards or that poses a threat to human health will be treated by SVE. Increased airflow caused by SVE and air sparging will remove contaminants from soils and promote biodegradation.
Remedial Action Objective	**Prevent the public from inhalation of airborne contaminants in excess of state or federal standards or that pose a threat to human health**
How Alternative will meet RAO	Soil containing contamination in excess of state or federal standards or that poses a threat to human health will be treated by SVE. Increased airflow caused by SVE and air sparging will remove contaminants from soils and promote biodegradation.
Remedial Action Objective	**Prevent the migration of contamination from the source area that would result in degradation of site-wide groundwater or surface water to levels in excess of state or federal standards or that pose a threat to human health or the environment**
How Alternative will meet RAO	A combination of SVE and air sparging will remove free product and the contamination from soils with concentrations contributing to site-wide groundwater contamination in excess of ARARs. Air sparging will treat leachate and soil contaminants below the water table. The air sparging system will treat leachate until ARARs are met at the GMZ boundary.

Following a more thorough investigation, the extraction NAPL and implementation of SVE in combination with air sparging will remove and treat the principal threat wastes from Source Area 9/10. Based on information currently available, the lead agency believes the Preferred Alternative meets the threshold criteria and provides the best balance of tradeoffs among the other alternatives with respect to the balancing and modifying criteria. The Illinois EPA expects the Preferred Alternative to satisfy the following statutory requirements of CERCLA § 121(b): (1) be protective of human health and the environment; (2) comply with ARARs (or justify waiver); (3) be cost effective; (4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and (5) satisfy the preference for treatment as a principal element, or explain why the preference for treatment will not be

met.

Area 11

Alternative SCS-11C (Soil Vapor Extraction) and SCL-11A (No Action) are the preferred alternatives for Area 11.

This alternative is recommended because it will provide substantial risk reduction by treating the source materials constituting principal threats at the site. Alternative SCS-11C will reduce risks in the shortest amount of time for a reasonable cost.

Under this alternative, contaminated soils would be remediated in-situ via a vapor extraction system. This alternative will consist of the installation of five vacuum extraction wells into the locations of the hot spots in the area. The wells will be screened in the vadose zone, where they will remove volatile contaminants from the unsaturated zone as well as some leachate contaminants that are able to diffuse from the surface of the water table. Due to the presence of NAPL, it has been assumed that the wells will be constructed of carbon steel in case steam injection is required.

Given the presence of residual NAPL, it is expected that significant quantities of contaminated vapors will be extracted. The vapors will be treated with a catalytic oxidation unit.

The No Action Alternative has been selected for leachate. Institutional controls will be placed on groundwater usage within the GMZ, approximately four additional monitoring wells will be installed, and a groundwater and leachate monitoring program will be implemented at Area 11.

If analysis indicates that contaminants are not degrading to levels near MCLs or risk based corrective action levels, air sparging will be considered in addition to SVE. Air sparging has the added benefit of enhancing biodegradation in both groundwater and vadose zone soils and will address the concerns and RAOs for Area 11.

Polynuclear Aromatic Hydrocarbons were identified as COCs in soils at Area 11. Polynuclear Aromatic Hydrocarbons are not purposefully addressed by SCS-11C. Additional data will be obtained during remedial design to determine if PNAs are truly COCs due to industrial activities at Area 11, or simply contamination from other activities (i.e. naturally occurring sources or non-industrial human activities).

If the evaluation conducted during design identifies the need for remediation in addition to that outlined within this proposed plan and upcoming ROD, the remedy would be appropriately altered. Depending on the significance of the change in remedy, the agencies may be required to hold additional public meetings and allow public comment on the new remedy.

The estimated total present worth cost for the Area 11 alternative is $3,482,500.

The proposed alternative for Area 11 will meet all RAOs for Area 11. The table below

describes each RAO and how the alternative will meet them.

Remedial Action Objective	**Prevent the public from contact with soil containing contamination in excess of state or federal standards or that poses a threat to human health**
How Alternative will meet RAO	Soil containing contamination in excess of state or federal standards or that poses a threat to human health will be treated by SVE. Increased airflow caused by SVE will remove contaminants from soils and promote biodegradation.
Remedial Action Objective	**Prevent the public from inhalation of airborne contaminants in excess of state or federal standards or that pose a threat to human health**
How Alternative will meet RAO	Soil containing contamination in excess of state or federal standards or that poses a threat to human health will be treated by SVE. Increased airflow caused by SVE will remove contaminants from soils and promote biodegradation.
Remedial Action Objective	**Prevent the migration of contamination from the source area that would result in degradation of site-wide groundwater or surface water to levels in excess of state or federal standards or that pose a threat to human health or the environment**
How Alternative will meet RAO	SVE will remove free product and the contamination from soils with concentrations contributing to site-wide groundwater contamination in excess of ARARs. Computer modeling coupled with groundwater analysis will ensure that groundwater contamination will biodegrade at rates such that Area 11 leachate will not result in degradation of site-wide groundwater.

Soil Vapor Extraction will promote the continued natural attenuation of the principal threat wastes and will treat the surrounding materials. Based on information currently available, the lead agency believes the Preferred Alternative meets the threshold criteria and provides the best balance of tradeoffs among the other alternatives with respect to the balancing and modifying criteria. The Illinois EPA expects the Preferred Alternative to satisfy the following statutory requirements of CERCLA § 121(b): (1) be protective of human health and the environment; (2) comply with ARARs (or justify waiver); (3) be cost effective; (4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and (5) satisfy the preference for treatment as a principal element, or explain why the preference for treatment will not be met.

Works Cited

Camp Dresser & McKee. Operable Unit One Work Plan. April 2, 1990.

Camp Dresser & McKee. Operable Unit Two, Phase I Technical Memorandum. October 1992.

Camp Dresser & McKee. Operable Unit Two, Phase II Work Plan. March 1993.

Camp Dresser & McKee. Operable Unit Two, Remedial Investigation Report. January 1995.

Camp Dresser & McKee. Operable Unit Two, Feasibility Study Report. July 1995.

Camp Dresser & McKee. Draft Ecological Risk Assessment for Area 7. March 19, 1999.

Camp Dresser & McKee. Operable Unit Three, Risk Assessment Report. April 2000.

Camp Dresser & McKee. Operable Unit Three, Remedial Investigation Report. July 2000.

Camp Dresser & McKee. Operable Unit Three, Feasibility Study Report. September 5, 2000.

Cobb, Richard. Telephone Conversation. 2000.

Dust, Wayne. Telephone Conversation. 2000.

Fehr-Grahm & Associates. Excerpts of investigations at the former Rockford and Power Machinery (Mid-States Industrial) facility provided by Illinois EPA. 1989 and 1991. In: Camp Dresser & McKee. Operable Unit Three, Remedial Investigation Report. July 2000.

Harding Lawson Associates. Excerpts from RCRA Part B Permit Application provided by Illinois EPA. 1992. In: Camp Dresser & McKee. Operable Unit Three, Remedial Investigation Report. July 2000.

Illinois EPA. Bureau File

Illinois EPA. Record of Decision: Groundwater Response Action (Operable Unit Two). 1995.

Illinois EPA. Various information within Bureau of Land Files including CERCLA Section 104(e) information requests. No Date. . Illinois EPA Bureau of Land Files L2010300074. Springfield, IL.

Lunden, J.W. Rockford: An Illustrated History. Windsor Publications, Inc. Chatsworth, CA. In: Camp Dresser & McKee. Operable Unit Three, Remedial Investigation Report. July 2000.

"National Oil and Hazardous Substances Contingency Plan." USEPA. Federal Register. 8 March 1990 55(46):1 - 52.

National Research Council. Alternatives for Groundwater Cleanup. National Academy Press. Washington

D.C. 1994, p. 204. In: Camp Dresser & McKee. Operable Unit Three, Remedial Investigation Report. July 2000.

Takas, Paul. Memo to Tracey Virgin with Laboratory Results attached. 7, January 1999. Illinois EPA Bureau of Land Files L2010300074. Springfield, IL.

United States. USEPA. Federal Register. 24 June 1988 53(122): 23996.

United States. USEPA. Federal Register. 31 March 1989 54(61): 13301.

USEPA. BIOSCREEN: Natural Attenuation Decision Support System User's Manual, Version 1.3. Office of Research and Development. EPA/600/R-96/087. August 1996. In: Camp Dresser & McKee. Operable Unit Three, Feasibility Study Report. September 5, 2000.

USEPA. A Guide to Preparing Superfund Proposed Plans, Records of Decision, and other Remedy Selection Decision Documents. OSWER. EPA540-R-98-031; OSWER 9200.1-23P; PB98-963241. July 1999.

USEPA. Groundwater Issue: Dense Non-aqueous Phase Liquids. By Huling, Scott.G. and James W. Weaver. OSWER. EPA/540/4-91-002. March 1991.

USEPA. Presumptive Remedies: Site Characterization and Technology Selection For CERCLA Sites with Volatile Organic Compounds In Soils. OSWER. EPA540-F-93-048; OSWER Directive 9355 0-48FS; PB93-963346. September 1993.

ACRONYMS

ARARs - Applicable or Relevant and Appropriate
BDL - below detection limit
Bgs - below ground surface
BTEX - benzene, toluene, ethylbenzene, and xylene
CDM - Camp Dresser & McKee
CERCLA - Comprehensive Environmental Response, Compensation and Liability Act
COCs - Contaminants of Concern
1,2-DCA - 1,2-Dichloroethane
1,1-DCE - 1,1-Dichloroethene
DNAPL - Dense Non-Aqueous Phase Liquid
FS - Feasibility Study
GAC - granular activated carbon
GMZ - Groundwater management zone
HAPs - Hazardous Air Pollutants
IDPH - **Illinois Department of Public Health**
Illinois EPA - Illinois Environmental Protection Agency
LNAPL - Light Non-Aqueous Phase Liquid
LTTD - Low Temperature Thermal Desorption
MCL - Maximum Contaminant Level
MPE - Multi-phase Extraction
NAPL - Non-Aqueous Phase Liquid
NCP - National Oil and Hazardous Substances Contingency Plan
NPDES - National Pollutant Discharge Elimination System
NPL - National Priorities List
O&M - Operation and Maintenance
OU(1,2, and 3) - Operable Unit (Number 1,2, and 3)
PCBs - Polychlorinated Biphenyls
PCE - Tetrachloroethylene, also known as perchloroethyelene
PNAs - Polynuclear aromatic hydrocarbons
ppb - parts per billion
ppm - parts per million
PRGs - Preliminary Remediation Goals
PRP - Potentially Responsible Party
RAL - Removal Action Level
RAOs - Remedial Action Objectives
RCRA - Resource Conservation and Recovery Act
RI - Remedial Investigation
RI/FS - Remedial Investigation/Feasibility Study
ROD - Record of Decision
SARA - Superfund Amendment s and Reauthorization Act
SVE - Soil Vapor Extraction
1,1,1-TCA - 1,1,1-Trichloroethane
TACO - Tiered Approach to Corrective Action Objectives
TCE - Trichloroethene, also known as Trichloroethylene
U.S. EPA - United States Environmental Protection Agency
USTs - underground storage tanks
VOCs - **Volatile Organic Compounds**

GLOSSARY

Specialized terms and acronyms that are used elsewhere and in this proposed plan are detailed below.

Administrative Record (*AR*) - a file that is maintained, and contains all information used by the lead agency to make its decision on the selection of a response action under CERCLA. This file is to be available for public review and a copy established at or near the site, usually at one of the Information Repositories.

Air Sparging - a remedial technology for treatment of groundwater or leachate. Air sparging is a process by which air is injected into the contaminated groundwater. The bubbles generated extract volatile contaminants from the groundwater as they rise to the surface.

ARARs (Applicable or Relevant and Appropriate Requirements) - *Applicable* requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under Federal or State law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site. *Relevant and Appropriate* requirements are those same listed standards that while not "applicable" at the CERCLA site, address problems or situations sufficiently similar to those encountered at the site that their use is well suited to the particular site.

BTEX (benzene, toluene, ethylbenzene, and xylene) - VOCs commonly associated with petroleum products such as gasoline, diesel, or jet fuel.

Catalytic Oxidation - a thermal treatment process that destroys contaminants at low temperatures (compared to most thermal processes) through the use of a catalyst.

CERCLA (*Comprehensive Environmental Response, Compensation and Liability Act or Superfund*) - a Federal law passed in 1980 and modified in 1986 to create a special tax that goes into a Trust Fund, commonly known as *Superfund*, to investigate and take remedial action at abandoned or uncontrolled hazardous waste sites.

COCs (contaminants of concern) - compounds that are present at the site in sufficient quantities to present an unacceptable risk to human health or the environment.

Dense Non-Aqueous Phase Liquid (DNAPL) - a substance, generally composed of carbon and hydrogen similar to petroleum, that does not mix well with water and is heavier, or more dense than water. Because DNAPLs are denser than water, they can sink to great depths in the groundwater.

Detection Limit - the minimum amount of a contaminant that can be routinely identified in the laboratory using a specific laboratory method. In some cases this limit is adjusted based on sample-specific activities such as dilution.

Dioxins - a generic term for a group of 75 related compounds known as polychlorinated dibenzo-p-dioxins. For the purposes of this proposed plan, the term "dioxin" refers to the most toxic dioxin, 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD), as well as related compounds including polychlorinated dibenzofurans and certain polychlorinated biphenyls with related properties.

Down gradient - a physical location where groundwater is present at a lower elevation, similar to "downhill".

Ecological screening benchmarks - *see "screening ecotoxicity values"*

Exposure pathway - a means by which a person may come in contact with site contaminants.

Feasibility Study (FS) - A description and analysis process that identifies and screens cleanup alternatives for remedial action. The FS analyzes the technology and costs of the alternatives in detail. The FS is normally conducted in conjunction with the RI in a process referred to as the RI/FS.

Furans - A generic term referring to a group of chemical s also known as polychlorinated dibenzofurans. See also "Dioxin"

Granular Activated Carbon (GAC) - carbon, in the form of grains, that is treated so that it absorbs organic material in vapors, gases, or water

Groundwater - underground water that fills pores in soils or openings in rocks to the point of saturation.

GMZ (Groundwater management zone) - a three-dimensional region containing groundwater being managed to mitigate impairment caused by contamination. The GMZ boundary becomes a perimeter around the site, similar to an imaginary fence, where on the outside of the boundary, groundwater must meet state standards.

Hazard Index - see Human health risks

Hazardous Air Pollutants (HAPs) - Air pollutants which are not covered by ambient air quality standards but which, as defined in the Clean Air Act, may present a threat of adverse human health effects or adverse environmental effects. Such pollutants include asbestos, beryllium, mercury, benzene, coke oven emissions, radionuclides, and vinyl chloride.

Headspace analysis - a procedure where a soil sample is placed in a closed container for approximately 30 minutes. After approximately 30 minutes, the sampling probe of an organic vapor monitor is placed inside the container, just above the soil to test any organic vapors that have accumulated. This procedure provides a quick approximation of the degree of organic contamination in a sample.

Hot spot - location of highly contaminated soil or leachate within a source area

Human health risks - threats to human health are usually evaluated as carcinogenic (those compounds that can cause cancer), and non-carcinogenic (those compounds that can cause harm, but not cancer). For carcinogenic risks, risks are usually quantified as a unitless probability of a person getting cancer. U.S. EPA's generally acceptable risk range for site-related exposures is 10^{-4} to 10^{-6}. The potential for non-carcinogenic effects is evaluated by the ratio of exposure to toxicity, called the Hazard Quotient. Adding all of the Hazard Quotients together generates the Hazard Index. A Hazard Index less than 1 is considered acceptable in that toxic effects are unlikely.

Incineration - A treatment technology involving destruction of waste by controlled burning at high temperatures;

Leachate - contamination that could potentially migrate, or has migrated from a source area into site-wide groundwater. For the purposes of this proposed plan, shallow groundwater that exists immediately below and in the vicinity of the four primary source areas is also considered leachate.

Light Non-Aqueous Phase Liquid (LNAPL) - a substance, generally composed of carbon and hydrogen similar to petroleum, that does not mix well with water and is less dense than water. Because LNAPLs are less dense than water, they are usually found floating on top of the groundwater.

Low Temperature Thermal Desorption (LTTD) - a thermal treatment process that heats up contaminated media in order to volatilize off the contaminants rather than destroy them.

Maximum Contaminant Level *(MCL)* - the maximum permissible concentration of a contaminant in water that is delivered to any user of a public water system. MCLs are a set of enforceable standards for drinking water quality.

Multi-phase Extraction (MPE) - a remedial technology whereby soil vapors and groundwater are extracted at the same time through the same extraction point. MPE is an enhancement of SVE which just extracts soil vapors.

NAPL (Non-Aqueous Phase Liquid) - this is a generic term for a substance that does not mix well with water. If the concentration of the substance in the soil or groundwater is high enough, the substance will show up in concentrated pools at locations within or on top of the groundwater.

National Oil and Hazardous Substances Contingency Plan (NCP) - The basic policy which is also a regulation (40 CFR 300) that sets forth the procedures and standards for ranking and responding to releases of hazardous substances, pollutants, and contaminants.

National Pollutant Discharge Elimination System (NPDES) - A provision of the Clean Water Act which prohibits discharge of pollutants into waters of the United States unless a special permit is issued by EPA, a state, or, where delegated, a tribal government on an Indian reservation.

National Priorities List (*NPL*) - the United States Environmental Protection Agency's list of the most serious, uncontrolled or abandoned hazardous waste sites identified for possible long-term

remedial action.

Operable Units (OU) - an action taken as one part of an overall site cleanup.

Parts per billion (*ppb*) - an expression describing a small concentration, equal to an amount of one substance in a billion parts of another material; for example, one drop of alcohol in 16,000 gallons of water.

Parts per million (ppm) - an expression describing a small concentration, equal to an amount of one substance in a million parts of another material; for example, one drop of alcohol in 16 gallons of water.

Polychlorinated Biphenyls (PCBs) - a class of chlorinated compounds often present in industrial lubricants produced before 1976. Polychlorinated biphenyls are not very mobile or volatile in the environment, but are toxic.

Polynuclear aromatic hydrocarbons *(PNAs)* - a group of compounds composed of long chains of hydrogen and carbon and sharing a structural form. **Polynuclear aromatic hydrocarbons** are often by-products of combustion and are generated through natural and man-made activities. Sources of PNAs in the environment include automobile exhaust, forest fires, asphalt production, and manufacturing processes (EST 1992).

Preliminary Remediation Goals (PRGs)- *numeric concentrations (prepared for evaluation purposes)* that the remedy must achieve in order to be protective of human health and the environment. Preliminary Remediation Goals are site specific and take into account site conditions and land use. The ROD will finalize the preliminary remediation goals set forth in this proposed plan.

Presumptive Remedy - preferred remediation technologies for common categories of sites based on historical remedy selection and engineering studies.

Principal Threat - source materials that are considered to be highly toxic or highly mobile that generally cannot be reliably contained or would present a significant risk to human health of the environment should exposure occur.

Proof-of-Performance Test - a pre-test of a technology prior to full-scale operation during which several parameters are measured to ensure that conditions are adequate for destruction of contaminants.

Proposed Plan - a public participation requirement of CERCLA in which Illinois EPA summaries for the public the preferred cleanup strategy, rationale for the preference, alternatives presented in the detailed analysis of their remedial investigation. This document must actively solicit public review and comment on all alternatives under consideration.

PRP (*Potentially Responsible Party*) - any individual(s) or company(s) potentially responsible for, or contributing to, the contamination problems at a hazardous waste site. PRPs can include present and former site owners and operators, as well as anyone who generated or transported the hazardous wastes found at the site. Whenever possible, through administrative and legal actions, Illinois EPA/USEPA requires PRPs to clean up sites they have contaminated.

Reactive Barrier Wall - essentially, an underground trench filled with a reactive substance such as iron fillings that will react with groundwater as it flows through the wall.

Receptor - Living organisms (people, animals or plants) or specific media (groundwater, surface water, soil, or air) that are exposed to a threat caused by a contaminant

Record of Decision *(ROD)* - a public document that explains which cleanup alternatives will be used and provides support for the selection. The ROD is based on information and technical analysis generated during the remedial investigation and consideration of public comments and community concerns.

Remedial action - long-term actions taken to address releases of hazardous substances that require expedited response.

Remedial Action Objectives - Site-specific statements which define the degree of cleanup necessary to protect human health and the environment.

Remedial Design - the component of a remedial action that involves the planning and testing of the chosen remedy to ensure that it will be effective at a site

Remedial Investigation (RI) -a study designed to gather the data necessary to determine the type and extent of contamination and threat at a Superfund site. The RI is usually conducted in combination with the Feasibility Study and referred to as the RI/FS.

Removal action - short-term immediate actions taken to address releases of hazardous substances that require expedited response.

Removal Action Level (RAL) - the concentration of a specific contaminant that must be present for U.S. EPA to spend removal action money to remedy the situation

Resource Conservation and Recovery Act *(RCRA)* - a Federal law enacted in 1976 that established a regulatory system to track hazardous substances from their generation to disposal. The law requires safe and secure procedures to be used in treating, transporting, storing, and disposing of hazardous substances. RCRA is designed to prevent the creation of new, uncontrolled hazardous waste sites.

Responsiveness Summary - a summary of oral and written public comments received by Illinois EPA during the comment period on key documents and the Illinois EPA's responses to those comments. The Responsiveness Summary is a key part of the ROD, highlighting community concerns for decision-makers.

Risk Assessment - a process that characterizes current and future threats to human health and the environment posed by contaminants at the site. The threats to human health (human health risk assessment) and the threats to the environment (ecological risk assessment) are usually evaluated separately for each site.

Screening ecotoxicity values - concentrations of a contaminant identified through laboratory testing that did not result in significant effects to relevant and sensitive test species.

Soil gas - the air or vapors located in soil pores beneath the ground surface

Soil saturation limit - *contaminant concentration at which soil pore air and pore water are saturated with* the chemical and the adsorptive limits of the soil particles have been reached.

Soil Vapor Extraction (SVE) - SVE is a remediation technology. It works by sucking out the contaminated air that exists in the soil pores beneath the surface. As the contaminated soil pore air is removed, more volatile compounds move from the soil into the soil pores, thereby cleaning up the soil as well as the soil pores.

Solvent - a liquid substance capable of dissolving or dispersing other substance (liquids or solids).

Southeast Rockford Superfund Site - a superfund site located in the Southeast portion of Rockford Illinois. The site is currently defined by the extent of groundwater contamination with total VOCs above 10 ppb.

Source Area - one of four locations identified as a primary contributor to the groundwater contamination that constitutes the site. The four primary source areas are: Area 4, Area 7, Area 9/10 and Area 11.

Superfund - see "CERCLA"

Superfund Amendments and Reauthorization Act (SARA) - An act passed in October of 1986 that amended and strengthened CERCLA.

TACO (Tiered Approach to Corrective Action Objectives) - a set of State of Illinois regulations that specify methods for developing remediation objectives and identifying chemicals of concern. The TACO regulations are located at 35 Ill. Adm. Code Part 742.

Underground storage tanks (USTs) - large containers, usually 500 gallons or more, that contain liquid materials beneath the surface of the ground.

Up gradient - a physical location where groundwater is present at a higher elevation, similar to "uphill".

Vadose Zone - region just below ground surface where soil pores are filled with air and small amounts of water

Volatile - readily vaporized at relatively low temperature.

Volatile Organic Compounds (VOCs) - carbon compounds such as solvents, that readily dissipates into the air

Water table - the point in the sub-surface where soils and soil pores surrounded by air (unsaturated) become surrounded by groundwater (saturated).